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The MANPRINT NDI guide addresses the key areas of NDI/MANPRINT interface by showing how the MANPRINT process is applied in each phase of the NDI acquisition process. The guide is intended for use in establishing the key MANPRINT issues to be included in the Independent Evaluation Plan (IEP), the Market Investigation (MI) and NDI procurement solicitation. The guide is designed to stress total system performance by: defining the MANPRINT performance concerns, developing MANPRINT issues relevant to those concerns, and preparing questions that address the performance issues during the MI. *Keywords:*

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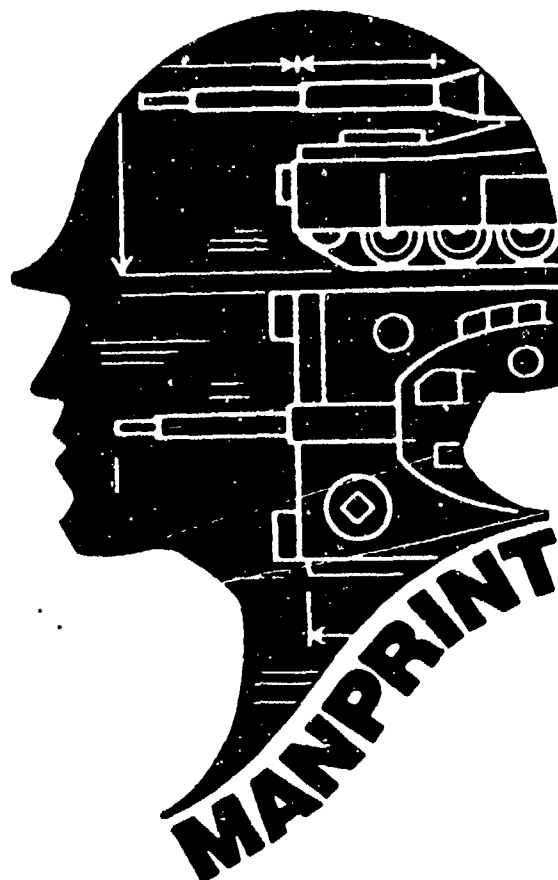
MANPRINT

HANDBOOK

FOR

NONDEVELOPMENTAL ITEM (NDI)

ACQUISITION



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26 January 1989

Man-Materiel Systems

MANPRINT HANDBOOK FOR NONDEVELOPMENT ITEM (NDI)
ACQUISITION

PREFACE

Background

In April 1976, the Director, Office of Management and Budget (OMB), issued a policy for the acquisition of major systems intended to effect reforms that would reduce cost overruns and maximize performance. OMB Circular Number A-109 describes an iterative program that forms the basis of today's approach to acquisitions within the Army. Central elements of the program are identification of mission needs (performance requirements) and evaluation of options (performance evaluation). This approach provides a logical basis for making decisions in the acquisition process to meet the mission needs in an economical, effective, and efficient manner.

The Army has recognized the importance of Manpower and Personnel Integration (MANPRINT) in achieving identified performance goals during the acquisition of hardware and operational software systems. MANPRINT goals and constraints are stated in System MANPRINT Management Plans (SMMP) and are included in system requirement and contractual documents. Army Regulation 602-2, MANPRINT in the Materiel Acquisition Process, describes the program policies.

The Requirement for an NDI MANPRINT Guide

The requirement for a Nondevelopmental Item (NDI) MANPRINT guide has evolved from the increasing emphasis on NDI as an acquisition strategy and the continued need to optimize total system performance--"Getting more bang for the bucks".

The 1987 Defense Authorization Act includes language that may influence the Department of Defense to move increasingly toward NDI for future procurements. One of the major challenges in producing this procurement guide is to develop the methodologies for deciding whether MANPRINT requirements can be met in an NDI procurement, recognizing that in many cases Army specifications and standards will not be fully met by available hardware in the marketplace.

MANPRINT/NDI Approach

The MANPRINT NDI handbook addresses the critical areas of NDI-MANPRINT interface by examples and discussion of how MANPRINT applies to the NDI acquisition process as the NDI strategy develops through each period of activity. This Handbook is not intended to provide specific wording or to supplant specific advice available from Subject Matter Experts (SME). The guide is intended for use in establishing the key MANPRINT issues which are to be included in the Independent Evaluation Plan (IEP). MANPRINT issues (which are addressed in terms of manpower, personnel, training, safety, health hazards, and human factors) support the Army's requirements and

constraints as they pertain to soldier performance and capabilities for the system under consideration.

Once the issues are addressed in the IEP, they can be included as part of the Market Investigation (MI) and the results integrated in the NDI procurement solicitation.

A major use of the guide is to aid in the development of questions for industry. These questions will be used as part of the market investigation (MI) and solicitation process. Since a goal of NDI is to minimize testing, much of the basic information for MANPRINT market decisions will be derived from the MI and solicitation responses. The questions asked must relate to the critical performance issues used to develop the IEP and should encompass all six MANPRINT domains.

The general approach used in the guide stresses total system performance by: defining the MANPRINT performance concerns; developing MANPRINT issues relevant to those concerns; preparing questions that address the performance issues during the MI; and, linking the MI questions to the MANPRINT issues and domains.

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**MANPRINT
HANDBOOK FOR
NONDEVELOPMENTAL ITEM (NDI)
ACQUISITION**

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CHAPTER 1 INTRODUCTION

1.1 Purpose

a. The purpose of this handbook is to assist the Army in obtaining systems through NDI acquisitions that optimize the Army's MANPRINT requirements, thereby enhancing total system performance. In order to achieve this goal, the guide considers all stages of the NDI process. The guide is designed to aid users in:

- Defining the system performance requirements and constraints from a MANPRINT perspective;
- Specifying issues for the six MANPRINT domains that affect those performance requirements and constraints;
- Developing questions that address identified issues and can be sent to industry as part of the market investigation;
- Evaluating the viability of an NDI acquisition based upon the information from the market investigation; and
- Determining what MANPRINT requirements should go into the NDI solicitation document.

b. In accomplishing these goals, the guide is consistent with Federal Acquisition Regulations, and Defense, Army, and AMC Federal Acquisition Regulation Supplements that govern procurements.

1.2 Applicability

The proponent for this guide is the Army Materiel Command (AMC). MANPRINT, however, requires the coordinated efforts of both Training and Doctrine Command (TRADOC), AMC, and the Program Executive Officer (PEO) (for PEO managed systems). For this reason, this handbook is written to cover all perspectives. By developing an increased understanding of the integrated nature of the MANPRINT process, this guide will be useful to materiel developers, logisticians, combat developers, training developers, and MANPRINT managers in all organizations.

There are two critical aspects of MANPRINT. The first links the design of the system to its expected field performance in the hands of the likely military operators and maintainers. The second critical aspect is timing--MANPRINT must be considered early in the acquisition process. By doing so, the materiel, combat, and training developers and logisticians will be able to influence the selection of, and modifications to, NDI systems.

1.3 Acronyms, Terms, and References

a. Acronyms and Abbreviations. A complete listing of acronyms used throughout this document can be found in Appendix C.

b. Terms. NDI-MANPRINT terms are explained as they are introduced in the body of the text.

c. References and Selected Reading List. References are listed at the end of each chapter. A consolidated listing of references used in developing this guide and related materials is contained in Appendix D along with information on how to obtain the publications listed.

1.4 Handbook Description

This handbook is designed to show how MANPRINT can be developed and applied during the normal evolution of the NDI acquisition process--from initial identification of a need during preprogram activities through follow-on test and evaluation in the Production and Deployment Phase. Areas requiring expanded detail are discussed in separate sections. The following information is provided to aid user effectiveness.

1.4.1 Handbook Organization.

This guide is organized to provide help to all users--from novice to expert. The general organization of this handbook, as well as of each chapter, is to present the big picture, highlight the areas with MANPRINT implications, and then develop the MANPRINT activities and applications within those areas.

a. The Big Picture.

Chapter 2 is a synopsis of the NDI Acquisition Process.

Chapter 3 provides a synopsis of the MANPRINT program, the relationship of MANPRINT to total system performance and an introduction to the MANPRINT domains.

b. Key Areas.

Chapter 4 is an overview of how MANPRINT applies to the NDI acquisition process.

c. MANPRINT Development and Applications.

Chapters 5, 6, 7, 8, and 9 deal with the specifics of how MANPRINT is incorporated and applied during preprogram activities and each of the NDI Acquisition Phases. A separate chapter deals with the Milestone Decision Reviews.

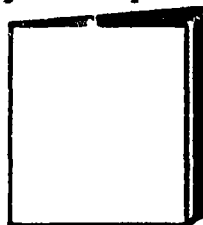
d. Areas of Concentration.

Chapter 8 provides additional detail on MANPRINT evaluation which is the cornerstone of MANPRINT in NDI.

Chapter 10 addresses training devices with concentration on a unique category of NDI--commercial training devices.

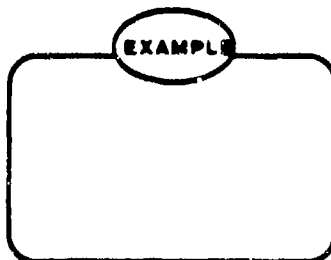
1.4.2 Chapter References.

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1.4.3 Examples.

a. Two styles of examples are provided. The first type is incorporated in the body of the text to clarify or illustrate the text material. The second type of example, indicated by the following symbol, is provided throughout this guide to show applications of the text material.



b. Examples are provided for clarification purposes and represent an acceptable approach, but not necessarily the only one, to applying MANPRINT.

1.5 Introduction to MANPRINT Examples: The Commercial Generator Sets and Assemblages (CGSA) Program

a. Throughout this guide, examples are provided to enhance understanding of MANPRINT applications in an NDI acquisition. These examples employ a combination of actual and hypothetical information based on the Commercial Generator Sets and Assemblages (CGSA) program.

b. The CGSA program is an NDI acquisition of commercially available--some military enhancement will be necessary--generator sets for extended use in meeting military requirements for quiet, reliable, electric power. The program consists of both skid mounted and towed configurations in ranges from 3 KW to 100 KW sizes.

c. The CGSA's primary function will be to provide electric power to enhance the mission performance of operational forces and systems on the integrated battlefield. CGSAs will replace, or supplement, existing military standard sets in combat, combat support, and combat service support units Army wide. Supported systems include command, control, communications and intelligence (C³I) systems, weapon systems, and logistics systems, including maintenance and medical support activities, operating in a mobile field environment.

CHAPTER 2 NONDEVELOPMENTAL ITEM OVERVIEW

2.1 What is a Nondevelopmental Item?

Nondevelopmental Item (NDI) refers to materiel that requires little or no development effort (and, therefore, little or no development expenses) by the Army. Normal sources of NDI materiel include commercially available products which may or may not require modification, materiel developed and in use by other US military services or Government agencies, and materiel developed and in use by other countries.

2.2 Nondevelopmental Item Procurement

The Army has traditionally developed most of its own equipment but increasingly is seeking NDI procurements to take advantage of the benefits available in systems that are already designed, developed, tested, and in production. The acquisition alternatives available cover a full spectrum from traditional full development programs to classic "off-the-shelf" NDI. Figure 2-1 shows the spectrum of acquisition strategies available. (See Reference 2c for a complete discussion.)

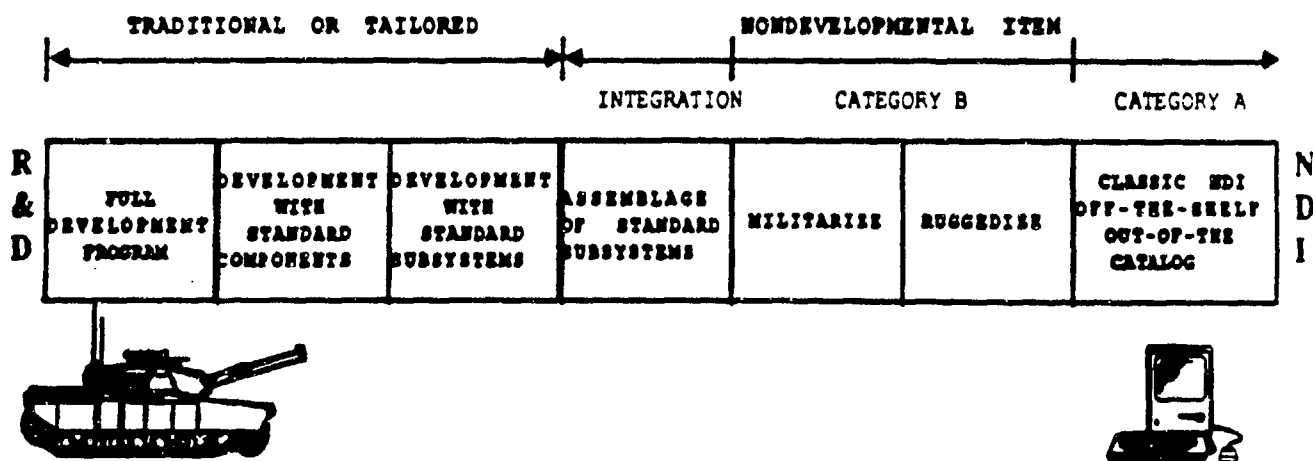


Figure 2-1--Acquisition Spectrum and NDI Categories

2.2.1 NDI Advantages.

NDI offers several major benefits:

a. Time to field is greatly reduced. This provides increased responsiveness to the users' needs.

b. Research and development costs are reduced. This provides lower overall acquisition costs.

c. State-of-the-art technology is used to satisfy user needs.

d. Mobilization base is expanded to include available commercial production facilities. Included are the commercial data (specifications, standards, and drawings) as it exists (Level 2).

e. Logistic support burden or costs can be significantly reduced through available provisioning manuals and special tools. The value derived from this can be enhanced through current supply and maintenance system flexibility.

2.2.2 Other NDI Considerations.

Along with advantages, there are also areas of concern that should be considered:

a. The materiel may not meet all of the users' initial requirements.

b. Essential Integrated Logistics Support (ILS) activities normally accomplished in preproduction phases must be accelerated and may increase up-front costs.

c. Proliferation of hardware and software systems may result, which can cause logistics support, training, and configuration management problems.

d. Safety deficiencies need to be evaluated to determine whether or not they pose an unacceptable risk.

e. The current program management documents such as the Basis of Issue Plan (BOIP), Department of the Army Master Priority List (DAMPL), Basis of Issue (BOI), and Table of Organization and Equipment (TOE) authorization process must be expedited due to the shorter NDI acquisition cycle.

f. Human factors engineering may not be adequately addressed.

2.3 Types of NDI

There is frequently a misconception that NDI and off-the-shelf commercial equipment are synonymous. As shown in Figure 2-1, there are different categories of NDI procurements in use in the Army. NDI categories are described in the following paragraphs. (See Reference 2a for more information.)

2.3.1 NDI Category A.

Category A procurements involve off-the-shelf items (commercial, foreign, other service) to be used in the same environment for which the items were designed. In this category, the item requires no development or modification of hardware or operational software, and testing is generally not required.

2.3.2 NDI Category B.

Category B procurements involve off-the-shelf items (commercial, foreign, other service) that will be used in an environment other than that for which they were designed. Here, the item often requires ruggedization, militarization or other modifications to the hardware or operational software. Although these modifications are "design changes", the opportunity for hardware redesign for MANPRINT purposes is usually minimal.

2.3.3 NDI Integration (formerly NDI "Other").

This category of NDI refers to procurements which make maximum use of NDI items as subsystems, modules, or components contributing to a materiel solution that entails system integration. This category requires dedicated R&D effort for systems engineering, software modification or development, and testing to ensure the total system meets user requirements and is producible as a system. In this case, there may be opportunities for MANPRINT input to hardware and software design.

2.4 The NDI Acquisition Process

Figure 2-2 (next page) provides an overview of the NDI materiel acquisition process. To enhance understanding, the NDI-MANPRINT process will be presented in four stages: Requirements-Tech Base Activities (activities prior to program initiation), Proof of Principle Activities, Development Proveout Activities, and Production and Deployment. (See also Figure 4-1, page 4-1, for a comparison of NDI and traditional full development life cycles.)

2.4.1 Requirements-Tech Base Activities.

As shown in Figure 2-2 (next page), the acquisition events begin during preprogram initiation, when the decision to seek a materiel solution to an identified deficiency is made. The TRADOC proponent school develops the Operational and Organizational (O&O) Plan which is reviewed by AMC. The approved O&O Plan is the program initiation (PI) document.

2.4.2 Proof of Principle Activities.

a. Market analysis activities provide the required information to determine whether or not to pursue an NDI solution to the identified materiel deficiency. Market analysis is conducted in two phases: Market Surveillance and Market Investigation. Each activity is introduced below but will be further detailed in the appropriate chapter.

b. At program initiation, a Concept Formulation Package (CFP) is developed to determine if NDI is feasible as an acquisition strategy. "Feasibility" refers to the availability of commercial products with a potential to satisfy the materiel need. NDI feasibility is determined based on information from the market

surveillance. Market surveillance is an ongoing activity conducted by AMC laboratories and Research, Development, and Engineering (RD&E) Centers, and the US Army Security Assistance Command (USASAC) to maintain an awareness of commercial products and the technologies being developed and applied in the private sector (to include foreign products) with potential for Army use. The feasibility determination is made by the AMC commodity-oriented MSC's initial technical assessment based on TRADOC's operational requirements (essential user needs).

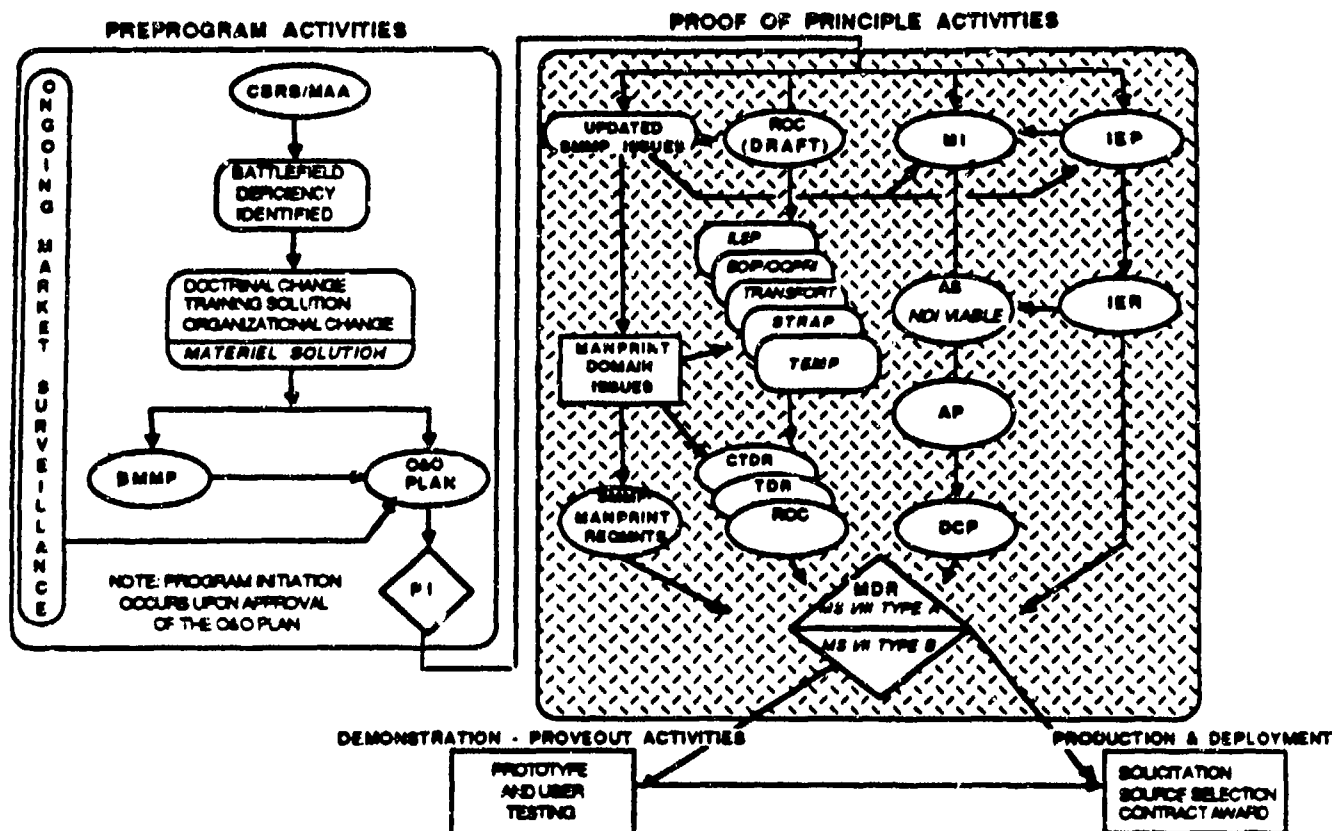


Figure 2-2--The NDI Acquisition Process

c. If NDI is considered feasible, a Market Investigation (MI) is conducted to determine if an NDI strategy is viable. "Viability" refers to available products that will meet the general materiel need based on the requirements defined in the O&O Plan. The MI is a detailed search for information tailored to the materiel need. During the Market Investigation, an assessment must be made to determine availability of hardware and software consistent with operational and performance requirements, what limitations may exist, and what information is available for evaluation. Initial information will also indicate where tradeoffs are possible so that a thorough assessment may be made on the viability of pursuing an NDI acquisition strategy. The purpose of the MI is, however, to seek "generic" solutions that meet Army requirements. No specific product can be identified and no purchase description developed that will limit the

Army's ability to seek a competitive solution.

d. The O&O Plan is used as the principal basis for developing the Independent Evaluation Plans (IEP) which describe the issues and evaluation criteria to be addressed in the MI. As the users' needs become more defined, the Required Operational Capability (ROC) is developed and forms the basis for eventual solicitation. Subsequent to the MI, Independent Evaluation Reports (IER) (technical and operational) are written which become the central documents used at the Milestone Decision Review (MDR) in determining approval or disapproval of the NDI acquisition strategy.

e. Other actions are ongoing throughout each activity period. For example, the Test Integration Working Group (TIWG) is preparing the Test and Evaluation Master Plan (TEMP). The TIWG-TEMP process, while not an exclusive MANPRINT activity, starts during Proof of Principle activities and provides an important contribution to the overall success of the MANPRINT process. The role and importance of the other program documents are omitted here for purposes of brevity and will be discussed in Chapter 6.

2.4.3 Demonstration Proveout Activities (if required).

Once an NDI solution is authorized, the AMC commodity-oriented MSC updates the Acquisition Plan to support contracting efforts and finalizes the ILSP with consideration for special factors relating to the approved accelerated acquisition program. During the period, AMC in coordination with TRADOC prepares a formal specification or Functional Purchase Description for the solicitation. At the Milestone III Decision review, the Acquisition Strategy is approved and the item is type classified.

Category B and NDI Integration (formerly "Other") procurements incorporate modifications of hardware and operational software. These changes provide a limited opportunity to influence the design of modifications. Additionally, preproduction qualification testing may be required and information may be developed through qualification and user testing to answer remaining concerns.

2.4.4 Production and Deployment.

a. Procurement and Production.

(1) The two methods of procurement generally employed in an NDI acquisition are Two-Step Sealed Bidding and Negotiation. In both methods, offerors are asked to provide information to demonstrate that their proposed NDI hardware and operational software will meet the government's performance requirements. The questions and issues addressed during the MI and the resulting information generated provide a basis for determining what additional information should be required in the offeror's response to the solicitation in order to ensure that the products offered meet minimum performance and operational characteristics.

(2) The solicitation issued to industry will be predicated on full and open competition unless an approved Justification and Approval document is obtained per FAR 6.3. The solicitation document must describe in detail the information that the Army will require from all offerors to determine whether or not technical and operational requirements will be met. Information requirements can be addressed in the Statement of Work, Contract Data Requirement Lists (CDRL), and Instructions to Offerors, and should be tailored to solicit the minimum information required to address any unresolved issues contained in the IEP.

b. Deployment.

(1) During this period, operational units are trained, equipment is distributed, and logistics support provided. The Army has the materiel release process to assure that materiel released to the field is suitable in terms of safety and health, human factors engineering, performance, reliability, quality, environmental factors, and availability and adequacy of logistics support.

(2) Systems are fielded under the Total Package/Unit Materiel Fielding (TP/UMF) concept. TP/UMF minimizes the workload of the gaining unit by gathering the end item and all required support into a single package which is identified, assembled, funded, and deprocessed by the MATDEV. (For more information, see Reference 2c)

2.5 Chapter References

**FOR ADDITIONAL INFORMATION ON
CHAPTER 2, REFER TO:**

- 2 AR 70-1, System Acquisition Policy and Procedures**
- 2b. DA PAM 11-25, Life Cycle System Management Model for Army Systems**
- 2c. AMC-TRADOC PAM 70-2, Materiel Acquisition Handbook**

CHAPTER 3 MANPRINT OVERVIEW

3.1 What is MANPRINT?

a. The Manpower and Personnel Integration (MANPRINT) Program is a comprehensive management and technical program to assure total system effectiveness by continuous integration into materiel development and acquisition of all relevant information concerning Manpower, Personnel, Training, System Safety, Health Hazards, and Human Factors Engineering. MANPRINT achieves this objective by focusing attention on soldier performance and reliability as an integral part of total system performance and emphasizing front-end planning to achieve an optimum soldier-materiel system design during the acquisition process. (Reference 3a.) The initial emphasis of MANPRINT has been on affecting changes in traditional development acquisitions and much of the initial guidance is stated in developmental terms. To understand and apply MANPRINT in NDI requires an understanding of the underlying MANPRINT principles and objectives. In an NDI acquisition, the principles and objectives remain the same; it is the approach to achieving these goals that will differ.

b. The application of MANPRINT in the materiel acquisition process is achieved through early development of goals and constraints which are then translated into system performance requirements that include the soldier. For example, in developing a weapon system, one requirement might be that the weapon must be able to hit a target 8 out of 10 firings. From a MANPRINT perspective, the same requirement would state that a trained, weapon equipped soldier must be able to hit a target 8 out of 10 firings thereby shifting the emphasis from hardware performance to an integrated soldier and machine system performance. It should be noted that the MANPRINT perspective changes the equipment requirement. If the soldier must hit the target 8 out of 10 times, the weapon may have to be perfect (an unreasonable requirement) or the weapon may have to compensate for the soldiers weakness (inability to determine range, etc.).

3.2 MANPRINT and Total System Performance

a. MANPRINT's goal is to optimize total system performance. From a MANPRINT perspective, a total system includes the equipment (both hardware and software), the trained operators, maintainers, and support personnel, as well as the environment in which the total system must perform. The relationship of these various factors to the goals of the MANPRINT program are shown in Figure 3-1 (next page).

b. The underlying concept is that the MANPRINT objectives must be considered from a total system perspective. The new system must be evaluated on varying levels of interaction--at the soldier

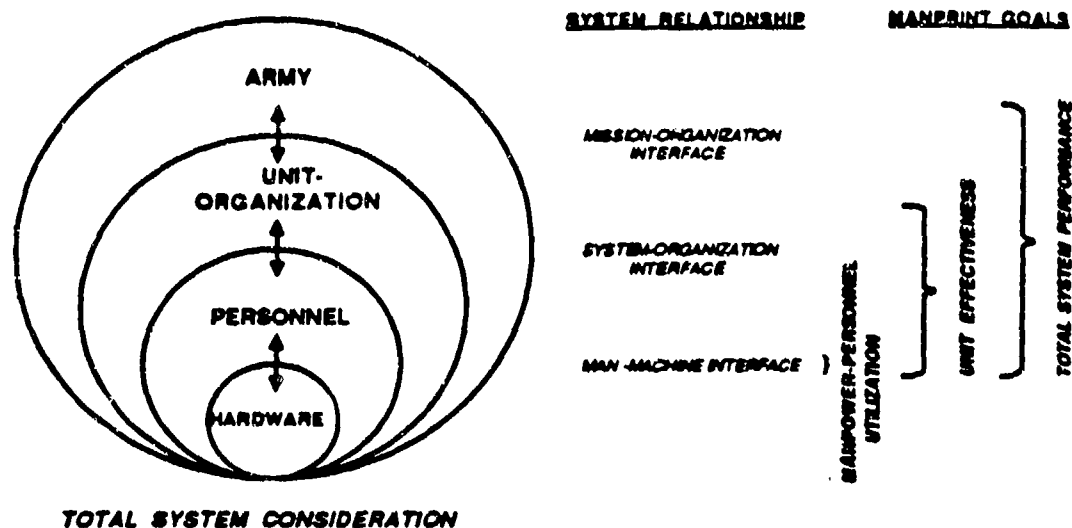


Figure 3-1--MANPRINT Goals and System Performance

(operator, maintainer, supporter) level, at the organizational level, and at the Army (mission) level in order to assess the total system impact.

c. This total system perspective leads to a succession of MANPRINT considerations that need to be addressed prior to and during NDI acquisitions.

3.3 The MANPRINT Domains

Soldier performance goals and constraints are addressed in MANPRINT through six domains: Manpower, Personnel, Training, Human Factors Engineering, System Safety, and Health Hazards.

NOTE: Some of the language used in describing the domains refers to developmental systems. This is done intentionally to provide an appreciation of the full scope of the domain.

3.3.1 MANPOWER.

a. Manpower addresses the affordability aspects of the Army's military and civilian human resources in terms of requirements (what we need) and authorizations (what we can have) resulting from the impact of new materiel systems. Manpower includes analysis of the numbers (reflected in spaces) and capabilities (reflected in MOS and grade) of people needed to operate, maintain, and support new materiel being considered or acquired. This includes maintenance and supply personnel as well as personnel required to support and conduct training. It requires a determination of the Army manpower changes generated by the addition of a new materiel system, comparing the new manpower needs with those of the old system(s) being replaced, and an assessment of the impact of the changes on the total manpower limits of the Army. If, given manpower constraints or priorities established by Department of the Army, the new materiel system cannot

be supported by projected human resources, then changes in system design, organization, or doctrine are made to achieve affordability. (Reference 3e.)

b. The soldier performance aspects of manpower include workload (can the system be operated and maintained at the designated manning levels?) and the impact of degraded manning on performance (can the system be operated and maintained at reduced manning levels and what is the system performance degradation?)

3.3.2 PERSONNEL.

a. Personnel refers to faces--the soldiers and civilians required to operate and support an Army materiel system. From a MANPRINT perspective, it is consideration of the ability of the Army to provide qualified people--in terms of specific capabilities (aptitudes and training required for basic skill development), experience, and other human characteristics--needed to operate, maintain, and support new materiel being considered or acquired. It requires detailed assessment of the aptitudes which soldiers must possess in order to complete training and use, operate, or maintain the system successfully. In a developmental system, iterative analyses must be accomplished as integral components of the design process to compare projected qualified personnel with (1) the requirements of the new materiel system; (2) any system(s) being replaced; (3) overall Army needs for similarly qualified people; and (4) constraints or priorities established by Department of the Army. As necessary, the new system is configured specifically to accommodate the capabilities of personnel projected to be available so that the new system is supportable from a personnel standpoint. Personnel assessments must consider not only availability but also the capability of the personnel management system to provide the right number of qualified personnel at the right place at the right time. (Reference 3f.)

b. The soldier performance aspects of personnel form the cornerstone of the MANPRINT program. The aptitudes and abilities of the soldiers are an integral part of total system performance and must be considered in equipment selection and design.

3.3.3 TRAINING.

a. Training is the consideration of the time and cost required to impart the requisite knowledge and skills to qualify Army personnel for use, operation, maintenance and support of new Army materiel systems, and the ability of the training base to support the training requirements levied by the new system. In a developmental system, training considerations involve (1) the formulation and selection of engineering design alternatives which are supportable from a training perspective, (2) the documentation of training strategies, and (3) the timely determination of resource requirements to enable the Army training system to support new materiel system fielding. Task analysis is used to determine the tasks which must be performed by the users, operators, maintenance and support personnel;

the conditions under which they must be performed; and the performance standards which must be met. Many other training factors must also be considered such as embedded training, sustainment training, new equipment training, unit training, and the need for training devices. *NOTE: Logistics Support Analysis (LSA) Task 301, Functional Requirements Identification, and LSA Task 401, Task Analysis, can be used to determine tasks. Both the logistic and MANPRINT communities (to include the training community) must work from the same task inventory for a particular system. (References 3g and h.)*

b. The soldier performance aspects of training center on aptitudes--what the soldier brings with him--and training--the knowledge that the Army imparts to the soldier after enlistment and throughout his career. Together, aptitudes and training result in skills which directly impact on the soldiers' performance contribution to total system performance.

3.3.4 HUMAN FACTORS ENGINEERING.

a. Human Factors Engineering (HFE) deals with the application of data, design criteria, psychological principles, and limits of human capabilities as they relate to the design, development, operation, checkout, maintenance and control of systems, equipment, or facilities to achieve mission success. (References 3i and j.)

b. The soldier performance aspects of HFE focus on the design of the hardware. The HFE goal is to maximize the ability of the soldier to perform at required levels by eliminating design induced soldier error and incorporating effective designs. HFE concentrates on determining the relationship of the soldier to the machine--it provides the interface between the domains and system engineers. The MANPRINT focus differs from HFE. MANPRINT stresses the integration of domain issues throughout the entire materiel acquisition process. MANPRINT seeks to optimize the human-machine interface within supportable levels of manpower, personnel, training, safety, and health hazards.

3.3.5 SYSTEM SAFETY.

a. System Safety involves the application of both engineering and management principles, criteria, and techniques to optimize safety within the constraints of operational effectiveness, time and cost throughout all phases of the new materiel system life cycle. As the name system implies, system safety deals with both the safety of the materiel system as well as the users, operators, maintenance and support personnel.

b. The soldier performance aspects of system safety focus on enhancing the ability of the soldier to perform to specified standards without unnecessary risk of injury or death, or equipment damage.

3.3.6 HEALTH HAZARDS.

a. Health Hazards refers to the application of biomedical and psychological knowledge and principles to identify, evaluate, and eliminate or control risks to the health and effectiveness of personnel who test, operate, maintain and support new materiel systems. A health hazard refers to an existing or likely condition, inherent in the use or operation of materiel, that can cause death, injury, acute or chronic illness, disability or reduced job performance of personnel. The focus of health hazards is on the soldier.

b. The soldier performance aspects of health hazards are closely aligned with safety and focus on enhancing the ability of the soldier to perform without unnecessary risk of illness, injury, or death due to short or long term exposure to the equipment, its component materiel, or its operation.

3.4 MANPRINT Domain Interdependence

MANPRINT is addressed in terms of its six domains. It must be realized, however, that each domain is interrelated with the others and that changes in one area usually have an impact in another as seen in the example on page 3-7.

While this is a simplified example, the "ripple effect" of changes can be clearly seen and must be considered when identifying tradeoffs in terms of modifying initial requirements or influencing the selection of a system that optimizes total system performance within the bounds of time, cost, and performance.

3.5 Chapter References

**FOR ADDITIONAL INFORMATION ON
CHAPTER 3, REFER TO:**

- 3a. AR 602-2, Manpower and Personnel Integration (MANPRINT) in the Materiel Acquisition Process
- 3b. AMC CIR 602-1 Manpower and Personnel Integration (MANPRINT)
- 3c. AMC-TRADOC PAM 70-2, Materiel Acquisition Handbook
- 3d. "The MANPRINT Primer", April 1987
- 3e. AR 570-4, Manpower Management
- 3f. AR 611-201, Enlisted Career Management Fields and Military Occupational Specialties
- 3g. AR 350-35, Army Modernization Training

-CONTINUED ON NEXT PAGE-

**CHAPTER 3 REFERENCES
CONTINUED:**

- 3h. TRADOC REG 350-7, A Systems Approach to Training
- 3i. AR 602-1, Human Factors Engineering Program
- 3j. MIL-H-46855, Human Engineering Requirements for Military Systems, Equipment, and Facilities
- 3k. AR 385-16, System Safety Engineering and Management
- 3l. MIL STD 882, System Safety Program Requirements
- 3m. AR 40-10, Health Hazard Assessment Program in Support of the Army Materiel Acquisition Decision Process

EXAMPLE

SITUATION:

The Army is considering buying a new off-the-shelf, state-of-the-art computer system to be used at battalion and higher levels for supply accountability.

MANPRINT FACTORS

MANPOWER: Will the new system increase requirements or authorizations for operators, maintainers, or support personnel?

PERSONNEL: Can the current target population operate and maintain the new system? Does the new technology require increased or different aptitudes in the target population?

TRAINING: Does the new system require new abilities in the target population? Will course lengths be changed?

SYSTEM SAFETY and HEALTH HAZARDS: Do the new technologies present any health or safety problems? Are there any system failures that can be inadvertently induced by the operator?

HUMAN FACTORS: Is the design layout compatible with predecessor system? Are any controls or support equipment similar in design but with different functions?

INTER-DOMAIN IMPACTS

PERSONNEL: Impacts on recruiting, grade structure, distribution.
TRAINING: Impacts on training base resources.

TRAINING: Impacts on course length (aptitudes and skill requirements) and course content (different systems and technologies)

PERSONNEL: Impacts on operating strength (course length increases)
MANPOWER: Impacts on authorizations (reduced operating strength)

PERSONNEL: Impacts on aptitudes.
TRAINING: Impacts on course content (train safety and health cautions and warnings)
HUMAN FACTORS: Design induced human error.

PERSONNEL: Impacts on aptitudes (trainability)
TRAINING: Impacts on course content (different controls and functions) and length (repetitive training to preclude confusion)
SAFETY: Increased risk of accident due to control error.

FOR TRAINING PURPOSES ONLY

Example EX-1--MANPRINT Domain Interdependence

CHAPTER 4 MANPRINT IN THE NDI ACQUISITION PROCESS

4.1 The NDI Challenge

a. The primary MANPRINT objective--to influence system design--seems to be at odds with procurement of NDI equipment where there is limited potential to impact system design. From a Nondevelopmental Item (NDI) perspective, the focus of MANPRINT must be on acceptability or limited modification--ruggedization or militarization--of a system. While NDI acquisitions are promising from a time, cost and technology standpoint, they present different challenges to integrating MANPRINT in the procurement and acquisition process. Figure 4-1 shows a comparison of the traditional life cycle versus the NDI life cycle.

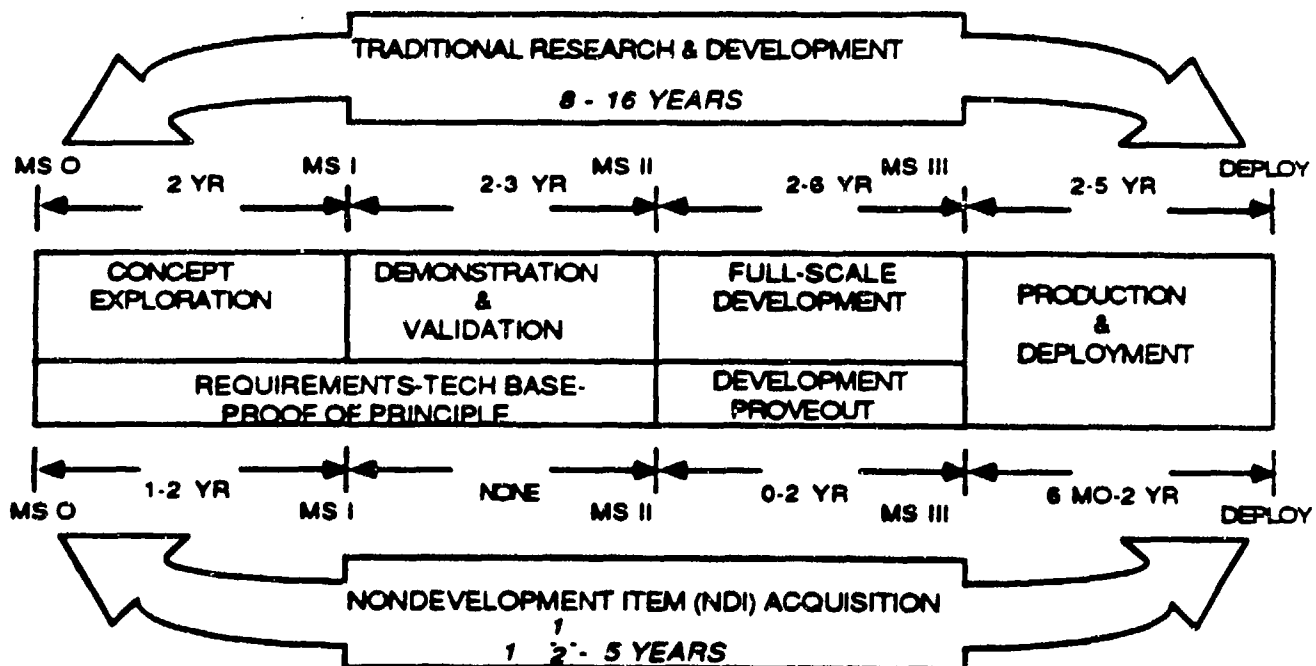


Figure 4-1--Acquisition Life Cycle Model

b. A compressed procurement cycle and limited testing may constrain MANPRINT analysis and evaluation. In NDI, MANPRINT must continue to address the soldier-machine interface issues which affect materiel system performance, reliability, and supportability. MANPRINT, therefore, is a primary discriminator in deciding whether or not an NDI procurement is viable.

4.1.1 Defining the System.

a. Underlying the NDI procurement process is a hierarchy of activities that need to be performed before a decision on the NDI acquisition strategy can be made. As illustrated in Figure 4-2, the

process begins with a determination of system performance requirements.

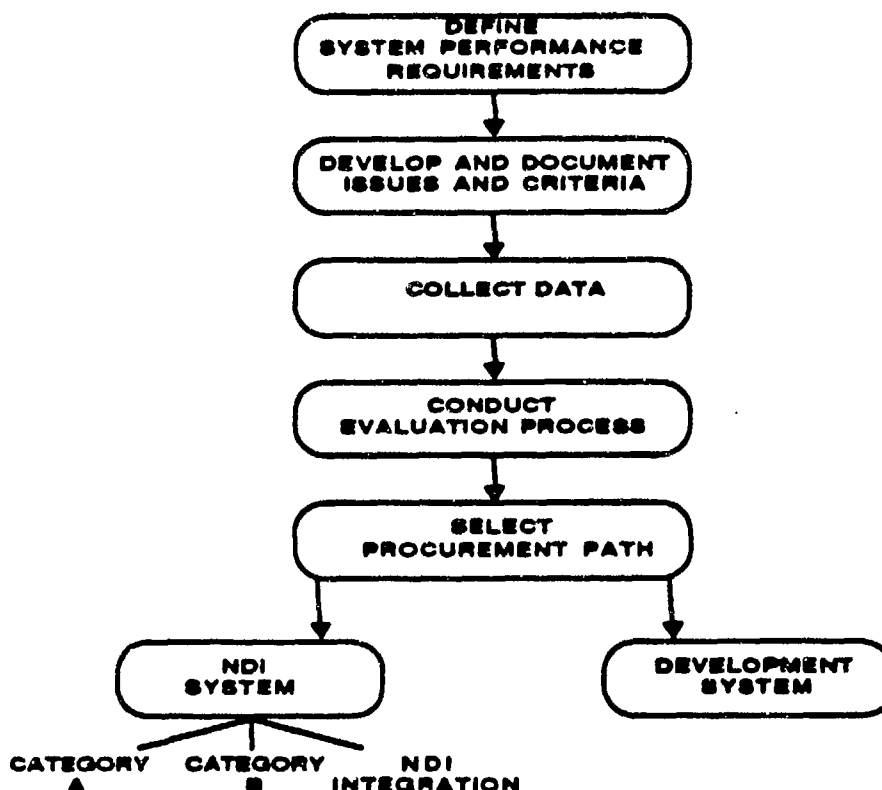


Figure 4-2--Determining the Acquisition Approach

b. From a MANPRINT perspective, system performance (P_s) is a function of the interrelated factors of equipment performance (P_e), soldier (human) performance (P_h), and the environment in which the system must operate (E) or $P_s f (P_e, P_h, E)$. An understanding of this relationship provides the basis for defining the MANPRINT approach to achieving system performance in an NDI acquisition. The definition of requirements must be in terms of the interrelated soldier-machine-environment performance. Once this has been accomplished, the issues and criteria can be developed in similar terms and the evaluation process can then consider the total system performance in terms of effectiveness, supportability, and availability. (For a complete discussion, see Reference 4f.)

4.1.2 MANPRINT Level-of-Effort.

MANPRINT is applicable in every materiel acquisition in varying degrees, and a System MANPRINT Management Plan (SMMP) is required for all Army systems. When considering MANPRINT, the focus must be on soldier performance. The extent to which system performance is affected by the soldier-machine interface will define the level of MANPRINT effort required in the acquisition program.

4.1.3 MANPRINT Applications.

a. When applying MANPRINT in the NDI process, consideration must be given to the performance impacts of each of the MANPRINT domains (Manpower, Personnel, Training, Human Factors Engineering, System Safety, and Health Hazards) as well as the interactions among the domains and between MANPRINT and the elements of Integrated Logistic Support (ILS). In dealing with each domain, requirements for information will be generated. Initially, the required information will be developed through the Market Investigation. Separate chapters will discuss not only the methods for obtaining information, but also the basis for assessing offerors' responses to determine if MANPRINT requirements will be met.

b. It must be recognized that NDI imposes a separate set of challenges for MANPRINT. For example, in a developmental acquisition, early MANPRINT analysis may be used to judge manpower and personnel requirements. A determination can be made as to whether the predetermined MANPRINT goals or constraints will be breached. If it appears they will be, a functional analysis can be performed and a reallocation of tasks from man to machine can be incorporated in the design to reduce the manpower demand (reduce workload) or soldier cognitive requirements (reduce aptitude requirements). In the NDI process, the design is fixed, and the MANPRINT requirements and constraints must be evaluated based on the information developed primarily through the Market Investigation and through the offerors' proposals. This is the heart of the challenge to MANPRINT in NDI--determining the magnitude of impact on requirements from marketplace information. Information required to make a judgment may not be immediately available or may require extrapolation from general information to draw specific conclusions.

4.2 MANPRINT and Program Documents

a. The success of MANPRINT is dependent upon its ability to influence program documents to ensure the optimal compatibility of the equipment and the designated operator, maintainer, and support personnel. The System MANPRINT Management Plan (SMMP) is the only "pure" MANPRINT document. Other program documents precede MANPRINT and it is through the embedding of MANPRINT issues, concerns, and constraints in these documents that MANPRINT becomes an integral part of the acquisition process. Many documents, such as the Test and Evaluation Master Plan (TEMP), Basis of Issue Plan (BOIP), Quantitative and Qualitative Personnel Requirements Inventory (QQPRI), New Equipment Training Plan (NETP), and the System Training Plan (STRAP) are important to a successful MANPRINT program and will be dealt with in appropriate chapters. Additionally, critical MANPRINT information will be obtained from source documents such as the Logistics Support Analysis (LSA), Safety Assessment Report (SAR) and Health Hazard Assessment Report (HHAR).

b. To ensure optimization of MANPRINT in an NDI procurement strategy, all MANPRINT and MANPRINT-related program documents (SMMP,

O&O Plan, IEP, and Market Investigation) should be staffed for comment through the MANPRINT Joint Working Group or the domain lead agencies (such as HEL field offices for HFE) prior to approval and implementation.

c. Early in an NDI acquisition program, three documents are central for success:

4.2.1 The System MANPRINT Management Plan (SMMP).

The System MANPRINT Management Plan is the Army's principal source document for all MANPRINT activities throughout the materiel acquisition process. A SMMP is initiated for each developmental, nondevelopmental, and product improved system (Reference 4b). It is a living document that is updated throughout the materiel acquisition process. (For more detailed information, see Reference 4g.)

a. Use. The SMMP is multi-functional, serving as a planning and management guide, an audit trail, and a source document for other program and management documents.

1) Planning and Management. The SMMP is used to identify the tasks and analyses required to resolve the MANPRINT issues and concerns raised through initial front end analysis (FEA) efforts. It incorporates a time line tailored to the acquisition strategy selected for each procurement.

2) Audit Trail. The SMMP serves as a continuity document for each Army acquisition. As tradeoffs are identified, decisions made, and issues resolved, all are recorded so that at any point in time, an audit trail of all pertinent actions is available.

3) Source Document. Later chapters will discuss how the SMMP provides input to primary program and management documents. The SMMP is used in the development of the O&O and Required Operational Capability (ROC). It documents the MANPRINT costs for the Cost and Operational Effectiveness Analysis (COEA) as well as providing issues for the Test and Evaluation Master Plan (TEMP).

b. The Target Audience Description (TAD). Tab G of the SMMP contains the TAD. The TAD identifies the projected operators and maintainers of the new equipment by Military Occupational Specialty (MOS). It provides a description of the quantity (force structure and operating strength) and quality (Armed Forces Vocational Aptitude Battery scores presented as ranges of aptitude area scores and Test Score Categories) of the target soldiers as well as biographical information, relevant anthropometric information, and training.

4.2.2 Independent Evaluation Plans (IEP).

A technical IEP is developed by the Technical Independent Evaluator (TIE). An operational IEP is developed by the Operational

Independent Evaluator (OIE). Both IEPs include appropriate MANPRINT inputs and lay out the methodology to provide an unbiased evaluation on whether or not the system satisfies the approved requirements (to include MANPRINT). IEPs provide for an independent assessment of information from all sources. IEPs provide the guidance for the market investigation.

4.2.3 The Market Investigation (MI).

The MI gathers information from surveys of the marketplace and other sources in direct response to the user's needs (requirements) contained in the O&O Plan. The information gathered will form the basis for developing the acquisition strategy for a particular requirement. This will include coordination of MANPRINT concerns and issues and criteria. It is critical to MANPRINT success that the MI not be performed in isolation by the AMC commodity-oriented MSC. (Chapter 6 will discuss how MANPRINT can interact with or influence the MI process.) It is the central activity leading to the initial milestone review decision that determines whether or not to select an NDI acquisition strategy.

4.3 Developing MANPRINT Issues

The SMMP provides a basis for issue development and documentation through early analysis of performance objectives. The identified objectives are then used in establishing the critical MANPRINT issues to be included in the Independent Evaluation Plan (IEP). These issues must address the Army's concerns and constraints as they pertain to soldier performance and capabilities for the system under consideration. Once these issues are included in the IEP, they can be addressed as part of the Market Investigation (MI). Figure 4-3 shows the relationship and the development process.

4.3.1 MANPRINT Performance Concerns.

a. In Chapter 3, Figure 3-1--MANPRINT Goals and System Performance--graphically depicted the relationship of MANPRINT goals to system performance. The specific elements (variables) that influence system performance were introduced at the beginning of this chapter (paragraph 4.1.1.b) and were described as a relationship (P_s f (P_e , P_h , E)). MANPRINT objectives must be considered within this total system perspective.

b. This total system perspective leads to a succession of MANPRINT performance considerations or goals that need to be evaluated during NDI acquisitions.

4.3.2 Performance Issues.

a. Performance concerns can be clarified by considering three aspects of system performance: system effectiveness, system supportability, and system availability. When these three aspects of performance are matched against the series of MANPRINT goals, a

structure emerges that can be used to identify generic MANPRINT

WHAT ARE THE TOTAL SYSTEM PERFORMANCE
(P_s) REQUIREMENTS?

WHAT ARE THE SOLDIER PERFORMANCE (P_h)
REQUIREMENTS?

WHAT ARE THE SOLDIER PERFORMANCE
ISSUES?

WHAT ARE THE SPECIFIC ARMY MANPRINT
QUESTIONS, ISSUES, CONCERNS?

WHAT QUESTIONS MUST INDUSTRY BE
ASKED TO RESOLVE THE ARMY
QUESTIONS?

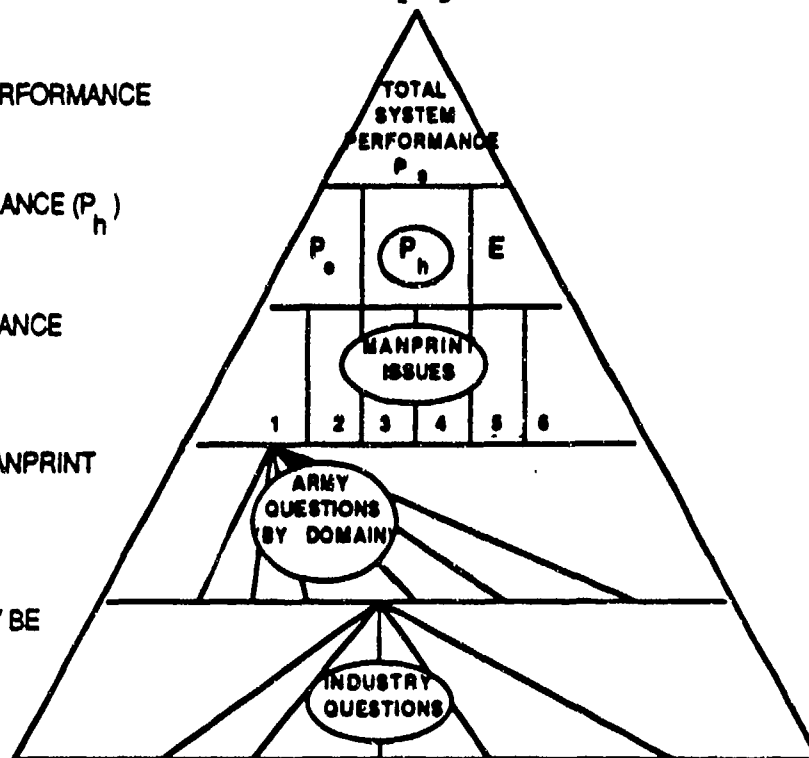


Figure 4-3--MANPRINT Issue Development

concerns. These concerns should be initially developed as system specific issues and, later, further refined in terms of the target soldier performance. The resultant matrix, shown in Figure 4-4, is the framework for defining the broad MANPRINT concerns and issues that need to be further developed during the NDI procurement.

b. The broad generic performance issues must now be translated into system MANPRINT performance issues and questions. This process serves two purposes; first, it provides initial system concerns when no predecessor system exists and second, it provides a starting point for information gathering when a system has a clear predecessor. An example of this process is shown at the end of the chapter.

EXAMPLE

REFER TO EXAMPLE EX-2 -
DEVELOPMENT OF GENERIC
SYSTEM CONCERNS

(Pages 4-8 to 4-9)

c. The broad system performance concerns will require further refinement to identify the target soldier performance elements which must be addressed and will be discussed in the next chapter.

	SOLDIER-MACHINE PERFORMANCE	UNIT PERFORMANCE	TOTAL SYSTEM PERFORMANCE
SYSTEM EFFECTIVENESS	1 THE PROBABILITY THAT THE SYSTEM WILL BE ABLE TO PERFORM ALL OF ITS INTEGRATED FUNCTIONS TO STANDARD UNDER OPERATIONAL CONDITIONS	2 THE PROBABILITY THAT THE UNIT WILL BE ABLE TO PERFORM ALL TASKS AND MISSIONS TO STAND- DARD IN THE OPERATING ENVIRONMENT	3 THE PROBABILITY THAT ALL OF THE DIFFERENT ELEMENTS WILL INTER- FACE CORRECTLY TO ACHIEVE TOTAL SYSTEM PERFORMANCE
SYSTEM SUPPORTABILITY	4 THE PROBABILITY THAT SOLDIERS WILL BE ABLE TO PERFORM ALL MAIN- TENANCE TASKS TO STAND- DARD UNDER OPERATIONAL CONDITIONS	5 THE PROBABILITY THAT SUPPORT UNITS WILL BE ABLE TO PERFORM RE- QUIRED SUPPORT TO STAND- DARD WITHIN THE PROJECTED OPERATIONAL ENVIRONMENT	
SYSTEM AVAILABILITY	6 THE PROBABILITY THE SYSTEM WILL MEET PER- FORMANCE CRITERIA AS OFTEN AS REQUIRED		

Figure 4-4--Basic MANPRINT Concerns for NDI Procurement

4.4 Chapter References

FOR ADDITIONAL INFORMATION ON CHAPTER 4, REFER TO:	
4a.	AR 70-1, System Acquisition Policy and Procedures
4b.	AR 602-2, Manpower and Personnel Integration (MANPRINT) in the Materiel Acquisition Process
4c.	AMC CIR 602-1 Manpower and Personnel Integration (MANPRINT)
4d.	AMC-TRADOC PAM 70-2, Materiel Acquisition Handbook
4e.	"The MANPRINT Primer", April 1987
4f.	"Handbook for Quantitative Analysis of MANPRINT Considerations in Army Systems", June 1986
4g.	"The System MANPRINT Management Plan Procedural Guide", February 1987
4h.	"A Concept for Developing Human Performance Specifications", April 1980
4i.	AR 70-10, Test and Evaluation
4j.	DA Pam 70-21, A Test and Evaluation Guide

EXAMPLEREFER TO CHAPTER 1, PARA 1.5
FOR EXAMPLE BACKGROUND

Figure 4-4. Basic MANPRINT Concerns for NDI Procurement, provides a framework for developing initial "generic" concerns by relating performance to effectiveness, supportability, and availability. These concerns provide a generic first-look which must then be addressed in more detail to establish their validity within the context of the system under consideration. An example of the translation from MANPRINT generic to broad system concerns is shown below. The use of this process provides initial concerns when no predecessor system exists and provides initial direction for data collection when the system under consideration is a replacement. From these broad concerns, soldier performance issues and goals will be developed.

GENERIC ISSUE-CONCERN	COMMERCIAL GENERATOR SETS & ASSEMBLAGES (CGSA) SYSTEM SPECIFIC ISSUE-CONCERN
<p>SYSTEM EFFECTIVENESS</p> <p>1. Soldier-Machine Performance</p> <p>The probability that the system will be able to perform all tasks to standard under operational conditions</p> <p>2. Unit Performance</p> <p>The probability that the unit will be able to perform all tasks and missions to standards in the operating environment</p> <p>3. Total System Performance</p> <p>The probability that all of the different specialties will interface correctly to achieve total system performance</p>	<p>Can the target audience soldier (MOS 52D, 63B, 63W, a 44B) operate and maintain the CGSA in a field environment under sustained operations?</p> <p>Does the CGSA increase or detract from the unit's ability to accomplish its designated mission considering logistics burden and other systems on hand?</p> <p>Will the CGSA resolve the identified battlefield deficiency?</p>

Initially, the concerns are broad in scope and will require refinement as the soldier performance issues are more clearly defined.

At the unit performance level, the interoperability and support issues are addressed. The ability of soldier to perform over periods of time within the organizational structure must be considered.

This is the "macro-level" consideration--total system performance to achieve the Army goal.

Page 1 of 2

NOTE: Highlighted issues will be carried through later examples to provide continuity of development.

FOR TRAINING PURPOSES ONLY

Example EX-2--Development of Generic System Concerns

EXAMPLE

REFER TO CHAPTER 1, PARA 1.5
FOR EXAMPLE BACKGROUND

GENERIC ISSUE-CONCERN	COMMERCIAL GENERATOR SETS & ASSEMBLAGES (CGSA) SYSTEM SPECIFIC ISSUE-CONCERN
<p>SYSTEM SUPPORTABILITY</p> <p>4. Soldier-Machine Performance</p> <p>The probability that soldiers will be able to perform all maintenance tasks to standards under operational conditions.</p> <p>5. Unit Performance</p> <p>The probability that support units will be able to perform required support to standards within the projected operational environment</p>	<p>Can the target audience soldiers (MOS 52D, 63B, 63W, and 44B) detect all maintenance faults with 95% accuracy within 10 minutes and perform organizational level repairs on the CGSA within 30 minutes in an NBC field environment?</p> <p>Can a trained Power Generation Equipment Repairman (MOS 52D) perform intermediate level repair (fault isolation and module replacement) correctly within one hour?</p>
<p>SYSTEM AVAILABILITY</p> <p>6. Soldier-Machine Performance</p> <p>The probability the system will meet performance criteria as often as required</p>	<p>Can the CGSA operate, with a trained target audience soldier performing all required preventive maintenance services, under sustained operations for a minimum of 500 hours without failure?</p>

Each of the elements addressed are designed to provide a starting point to identify the total system requirements. From this, the soldier performance elements can be identified and the desired performance levels can be defined in terms of the contribution of the equipment, the soldier, and the operational environment.

Examples of issue development from early analysis will be dealt with in more detail in later examples.

Page 2 of 2

NOTE: Highlighted issues will be carried through later examples to provide continuity of development.

FOR TRAINING PURPOSES ONLY

Example EX-2--Development of Generic System Concerns

**MANPRINT
HANDBOOK FOR
NONDEVELOPMENTAL ITEM (NDI)
ACQUISITION**

(INTENTIONALLY LEFT BLANK)

CHAPTER 5 MANPRINT APPLICATIONS DURING REQUIREMENTS - TECH BASE ACTIVITIES

5.1 Overview: MANPRINT Applications During Requirements-Tech Base Activities

a. The NDI acquisition life cycle incorporates preprogram activities, actions taken prior to approval of the Operational and Organizational (O&O) Plan, as an integral part of Requirements-Tech Base-Proof of Principle activities. For purposes of clarity and to establish how MANPRINT interacts with the NDI process, Requirements-Tech Base (preprogram) activities will be dealt with separately from the Proof of Principle activities.

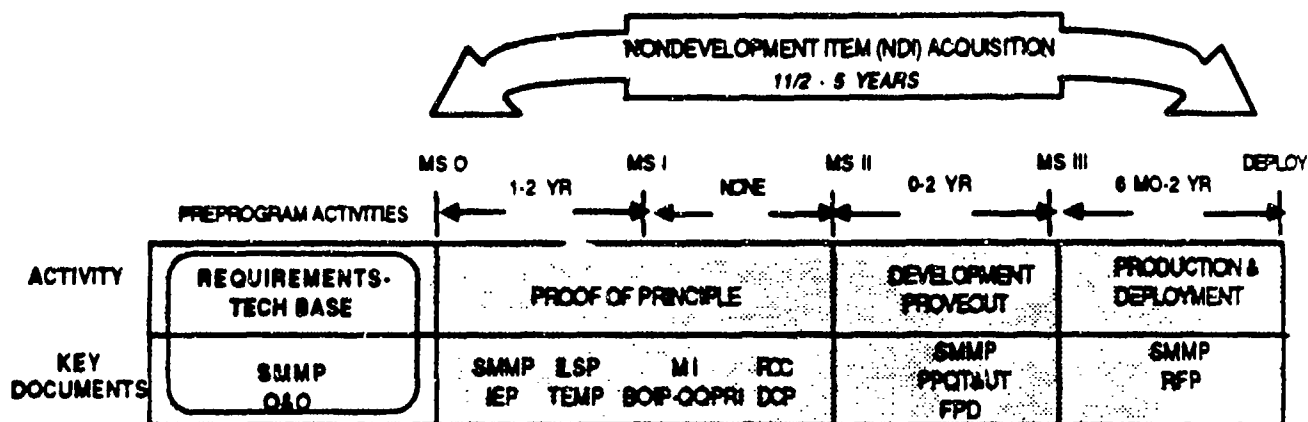


Figure 5-1--MANPRINT Related Documents in Requirements-Tech Base

b. The NDI process starts like traditional acquisition programs--so does MANPRINT in an NDI environment. The decision to seek an NDI solution is made during Requirements - Tech Base activities based on information obtained from the market surveillance. The decision to pursue NDI as an acquisition strategy is made at the initial Milestone Decision Review (MS I/II or I/III) based on the market investigation. The key to MANPRINT success is to begin early in the acquisition cycle. Two documents are central to that end--the System MANPRINT Management Plan (SMMP) and the Operational and Organizational (O&O) Plan.

5.2 MANPRINT Responsibilities Prior to Program Initiation

MANPRINT program success depends on a coordinated effort between the combat and materiel developer. Each has a shared responsibility for the success of the MANPRINT program.

5.2.1 The Combat Developer.

Prior to program initiation, the combat developer (CBTDEV), assisted by the training developer, is responsible for MANPRINT as

well as Logistic Support Analysis (LSA). The CBTDEV performs or coordinates early studies, analyses, and evaluations (to include LSA) on the proposed system to determine initial MANPRINT requirements. The CBTDEV serves as Chairman of the MANPRINT Joint Working Group (MJWG) and is responsible for initiating the System MANPRINT Management Plan (SMMP) and preparing the Target Audience Description (TAD).

5.2.2 The Materiel Developer.

The materiel developer (MATDEV) plays a supportive role prior to program initiation. It is important for the MATDEV to be involved early to develop an awareness of the MANPRINT program goals associated with the system through participation in the MJWG. The early information developed in the SMMP supports MATDEV requirements for initiating MANPRINT Assessment (formerly the Human Factors Engineering Analysis [HFEA]), Health Hazard Assessments (HHA), Test and Evaluation Master Plan (TEMP), and Integrated Logistics Support Plan (ILSP). By understanding the soldier performance limitations, the MATDEV can more effectively translate the user requirements in developing solicitation documents in later phases.

5.3 Initiating MANPRINT

The MANPRINT process begins with the decision to seek a materiel solution. MANPRINT is information-dependent and employs various analytical techniques to develop initial issues and concerns. These techniques, known collectively as front-end analysis (FEA), are tailored to the materiel system under consideration. To understand the when and how of MANPRINT requires an understanding of how the acquisition process begins. Figure 5-2 provides a process flow which is discussed in the following paragraphs.

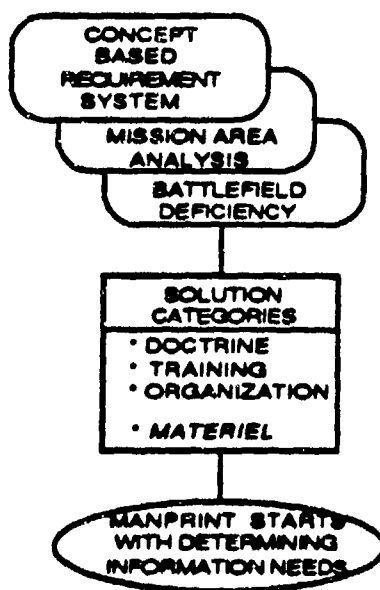


Figure 5-2--MANPRINT Initiation

5.3.1 Identifying the Need.

a. The Concept Based Requirement System (CBRS) is a systematic approach to determining future Army needs and resolving deficiencies in current battlefield capabilities. Within CBRS, proponents conduct analytical studies called Mission Area Analyses (MAA) to determine capability deficiencies in the programmed force against the threat in defined scenarios.

5.3.2 Identifying the Solution.

a. Solutions to identified deficiencies may lead to changes in doctrine in the way the Army will fight and provide logistics and maintenance support, changes in how training is accomplished, changes to organizations, or initiation of the materiel acquisition process for new materiel or improvement of existing equipment. Solutions usually require a combination of actions due to their close interrelationships.

b. If the decision is to go with a materiel solution, three alternative strategies are considered to resolve the materiel deficiency:

1) Improving an existing Army system to take advantage of existing training and logistics investments (Product Improvement [PI] and Preplanned Product Improvement [P³I]).

2) Buying off-the-shelf or modifying existing commercial, other service, or foreign equipment to meet system requirements (Nondevelopmental Item [NDI]). It should be noted that any strategy may involve NDI.

3) New development program (Traditional development or tailored development [formerly Army Streamlined Acquisition Program [ASAP]]).

5.4 Developing MANPRINT in Requirements-Tech Base

The TRADOC proponent combat developer (CBTDEV) is responsible for initiating and managing the early MANPRINT program. The variety of MANPRINT requirements and the need to meet specific milestones make it necessary to structure an organization to plan the interdisciplinary effort. Figure 5-3 (next page) depicts the MANPRINT development process as described below.

5.4.1 The MANPRINT Joint Working Group (MJWG).

a. The MJWG is established by the TRADOC proponent at the service school or center between three and six months prior to the start of the O&O Plan. The MJWG is important to MANPRINT because it is chartered to plan all MANPRINT inputs and activities for the entire system life cycle.

b. The membership of the MJWG is determined by the proponent and is based upon program needs and the nature of the acquisition.

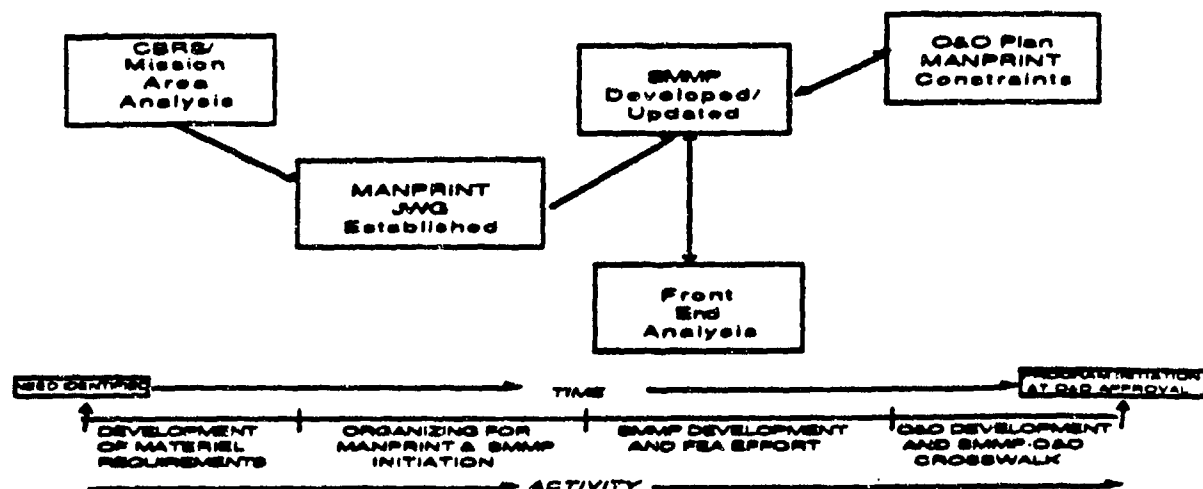


Figure 5-3--MANPRINT Development During Requirements-Tech Base

The composition of the MJWG may be altered as the program progresses through the acquisition cycle. Due to the interdisciplinary nature of MANPRINT, membership should include representation of proponent members with vested interest (Combat Developer, Training Developer, Personnel Proponent) and not be limited to school resources. Materiel Developer (MATDEV) involvement is particularly important for clear communication of desired goals and to facilitate the MANPRINT program management transition to the MATDEV at program initiation.

5.4.2 Front-End Analysis.

a. Front-end analysis (FEA) is a generic term that includes various analytical techniques. FEA includes those analyses conducted under the LSA 200 Series tasks (Mission and Support System Definition). As the name implies, FEA is conducted early in the acquisition process. The purpose of conducting FEA is to develop information to influence the direction of the acquisition program either by influencing the design or, in NDI, to influence the system requirements and the resulting system selection.

b. During preprogram activities, TRADOC has the lead for conducting FEA. Analyses such as the Early Comparability Analysis (ECA) provide information when predecessor systems exist. Knowing the MANPRINT related strengths and weakness of any predecessor system provides direction for the development of MANPRINT issues and concerns for new materiel acquisitions. An example of the issue development from early analysis is shown in Example EX-3 at the end of this chapter.

EXAMPLE
 REFER TO EXAMPLE EX-3 -
 DEVELOPING SMMP ISSUES FROM
 EARLY ANALYSIS
 (PAGES 5-7 to 5-9)

5.5 Initiating the System MANPRINT Management Plan

a. The CBTDEV has responsibility for initiating and updating the SMMP and shares responsibility for the maintenance of the SMMP with the MATDEV throughout the system life cycle. The MJWG provides the necessary expertise to address the MANPRINT domains.

b. The initial SMMP may be vague and incomplete. The focus is on identifying existing guidance that will affect the acquisition, potential predecessor or reference equipment, areas of concern, and analyses that may be required in the future. The MATDEV uses the information contained in the SMMP to begin development of program documents--discussed in Chapter 6--required after program initiation.

5.6 MANPRINT in the Operational and Organizational Plan

a. The O&O Plan is the program initiation document for those programs requiring a Mission Need Statement (MNS), Joint Service Operational Requirement (JSOR), or Required Operational Capability (ROC). It is prepared by the CBTDEV, in coordination with the MATDEV, training developer, transportability agent, logistician, MANPRINT planner, tester, evaluator, and interested MACOM. The O&O Plan is used as the front-end document for the MATDEV to initiate the materiel acquisition process. The approved O&O Plan provides the MATDEV with the minimum essential information regarding initial requirements and system capabilities.

b. Like the SMMP, the O&O Plan is developed and written by a Joint Working Group convened by the TRADOC Center or School assigned proponentcy for the system. The MANPRINT Manager (CBTDEV) and MATDEV should be active members of the JWG.

c. Initial MANPRINT issues and concerns should be identified and the SMMP well developed by the time the O&O is initiated. MANPRINT primarily impacts on paragraphs 4 (Operational Characteristics) and 7 (System Constraints). However, as shown in Figure 5-4 (next page), other information developed to support MANPRINT is also transferable to the O&O. "Crosswalking" soldier performance requirements and constraints in requirement and program documents ensures an internal consistency and integrates MANPRINT throughout the acquisition process.

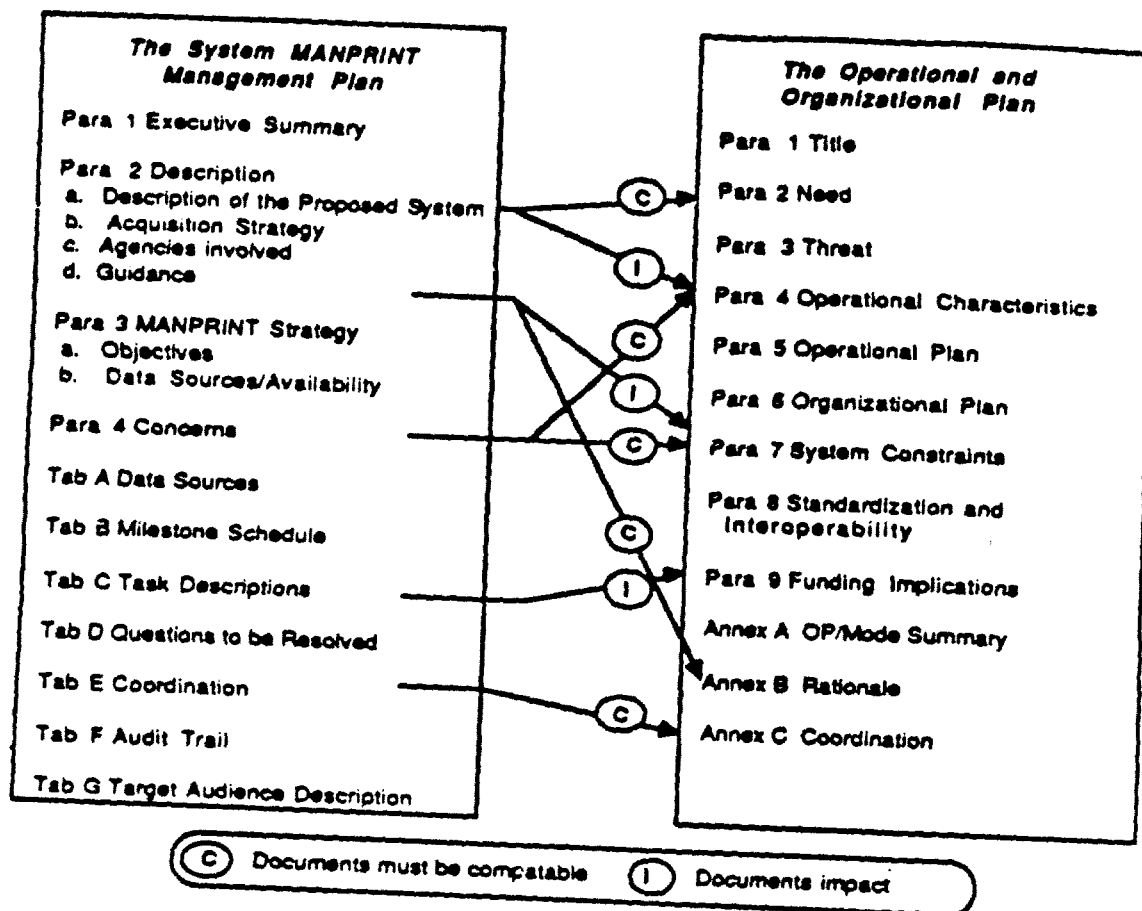


Figure 5-4--SMMP-060 Crosswalk

5.7 Chapter References

FOR ADDITIONAL INFORMATION ON
CHAPTER 5, REFER TO:

- 5a. AR 602-2, Manpower and Personnel Integration (MANPRINT) in the Materiel Acquisition Process
- 5b. AMC-TRADOC PAM 70-2, Materiel Acquisition Handbook
- 5c. "The SMMP Procedural Guide", February 1987
- 5d. "The MANPRINT Primer", April 1987

EXAMPLE

REFER TO CHAPTER 1, PARA 1.5
FOR EXAMPLE BACKGROUND

In example EX-2, broad MANPRINT concerns, applicable to the CGSA program, were developed to provide a starting point for information gathering and issue development.

Initial issues can be developed from a variety of sources. When a predecessor system exists, an Early Comparability Analysis can be conducted to identify "high driver" tasks--those costly in Manpower, Personnel, and Training (MPT). Less formal methods are also available which can identify system issues such as field surveys, accident report reviews (data available from the Army Safety Center), lessons learned (data available from CAC), Initial Health Hazard Assessment (requested from the Army Environmental Health Agency), as well as proponent information (MOS density, on hand strength versus authorized, critical MOS tasks, training program, etc.) and DA and TRADOC guidance. The following SMMP extract, with marginal annotations for clarity, demonstrates this process.

**System Manprint Management Plan (SMMP)
for the
Commercial Generator Sets and Assemblages (CGSA) Program**

1. Summary

a. (Description of system--Omitted)

b. The initial MANPRINT analysis is based on the mature predecessor DOD standard military generator sets, power units, and power plants with consideration given to deficiencies noted in these systems.

c. The key MANPRINT issues are:

(1) The ability of the target audience to perform operator tasks to standard in an operational environment.

(2) The ability of the target audience to maintain the system in an operational environment.

(3) The ability to conduct sustained operations with current personnel.

(4) The support requirements of the new sets and assemblages.

2. Description.

a. Description of the Proposed Materiel System (Omitted)

The purpose of the Summary is to highlight the key MANPRINT elements the program for the approving authority (normally the proponent CG) and to provide key issues that require increased awareness and attention.

Key issues are initially broad in scope and will be developed in later paragraphs and further refined in the Tabs. Based upon the information gathered and the initial generic approach (See Example 2) these key issues were identified.

Paragraph 2a provides an overview of the system including the deficiency, missions, operational environment, and essential man-in-the-loop characteristics.

Page 1 of 3

NOTE: Highlighted issues will be carried through later examples to provide continuity of development.

FOR TRAINING PURPOSES ONLY

**Example EX-3--Development of SMMP Issues
from Early Analysis**

EXAMPLE

REFER TO CHAPTER 1, PARA 1.5
FOR EXAMPLE BACKGROUND

b. Acquisition Strategy

The CGSA program is expected to be a Nondevelopment Item (NDI) acquisition of commercially available - some military enhancement will be necessary - generator sets for extended use, in meeting military requirements for quiet, reliable, electric power.

c. Agencies (Omitted)**d. Guidance.****(1) Decisions (Omitted)****(2) General DA and TRADOC Guidance (Omitted)****(3) Assumptions.**

(a) The CGSA will not have a designated operator.

(b) No increase in Manpower requirements.

(c) No increase in maintenance or training requirements.

(d) No new MOS will be created to operate or support the CGSA.

(e) Human error and system malfunction will be minimized.

(f) Quality of the Target Audience will not change.

3. MANPRINT Strategy.**a. Objectives.****(1) Manpower (Omitted)****(2) Personnel**

(a) No new MOS, ASI, or other personnel requirements will be created by the introduction of the CGSA into the Army.

The AS, when known, is listed and provides a basis for determining MANPRINT Milestones and shapes the direction of the MANPRINT program.

Guidance is a key source of potential system constraints which will impact on the development of issues.

Assumptions reflect system constraints that are not in the decisions and guidance provided

Assumptions may be based on the proposed employment, distribution of equipment, or general policies of the proponent, as well as early information derived from MANPRINT analysis.

Note in the highlighted assumptions that they impact on more than just the one key issue designated in the Summary for development in other examples. There is, however, an internal consistency that continues throughout the SMMP.

Page 2 of 3

NOTE: Highlighted issues will be carried through later examples to provide continuity of development.

FOR TRAINING PURPOSES ONLY

Example EX-3--Development of SMMP Issues
from Early Analysis

EXAMPLE

REFER TO CHAPTER 1, PARA 1.5
FOR EXAMPLE BACKGROUND

(b) Performance of critical maintenance tasks with 95% reliability by 90% (5th to 95th percentile) of the target audience.

(c) Physical requirements as defined by MEPSCAT and PULHES will not be changed.

(3) Training

(a) Train all critical maintenance tasks in the institution.

(b) Train all preventive maintenance service check (PMSC) tasks in the unit.

(c) Special training requirements will be minimized.

(d) Institutional training will not be increased over current course lengths for MOS 55D, 63B, 63W, and 44B.

(4) Human Factors

(a) Ensure that 95% of equipment faults are detectable within 10 minutes by the operator-maintainer.

(b) Ensure that 95% of target population can deploy, operate, and recover the system.

THE REMAINDER OF THE SMMP IS OMITTED

The MANPRINT goals are described in terms of ranges of population. This ties in with Tab G - Target Audience Description (TAD).

Training constraints which may influence the selection and modifications are provided.

Tab G - TAD, describes all operator and maintainer MOS.

State objectives in terms of performance goals.

The development of issues is enhanced by the format and structure of the System MANPRINT Management Plan. It is an internally cohesive document that supports the development process. Broadly identified issues are reflected in the MANPRINT concerns (Para 4). The concerns are derived from the program objectives identified through guidance, early analysis, and assumptions. Tab D-Questions, lists the MANPRINT questions that must be resolved to answer the concerns and support the objectives. Tab C-Task Descriptions, provides an outline of the tasks required to generate answers to the questions.

In further examples, the development and resolution of issues will be detailed.

Page 3 of 3

NOTE: Highlighted issues will be carried through later examples to provide continuity of development.

FOR TRAINING PURPOSES ONLY

Example EX-3--Development of SMMP Issues
from Early Analysis

**MANPRINT
HANDBOOK FOR
NONDEVELOPMENTAL ITEM (NDI)
ACQUISITION**

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CHAPTER 6 MANPRINT APPLICATIONS DURING PROOF OF PRINCIPLE ACTIVITIES

6.1 Overview: MANPRINT during Proof of Principle Activities

The primary MANPRINT focus during Proof of Principle activities is on defining the critical MANPRINT issues, establishing that MANPRINT constraints can be satisfied in the marketplace, and incorporating MANPRINT as an integral part of system requirements, program requirements and solicitation documents. The decision to pursue an NDI acquisition strategy is made during this period and incorporated in the Acquisition Plan. Formal approval occurs at the Milestone I/II or I/III Decision Review. The three MANPRINT intensive areas are the Independent Evaluation Plan (IEP), the Market Investigation (MI), and the Required Operational Capability (ROC). Additionally, a Functional Purchase Description (FPD) may be prepared. FPDs will be discussed in Chapter 8.

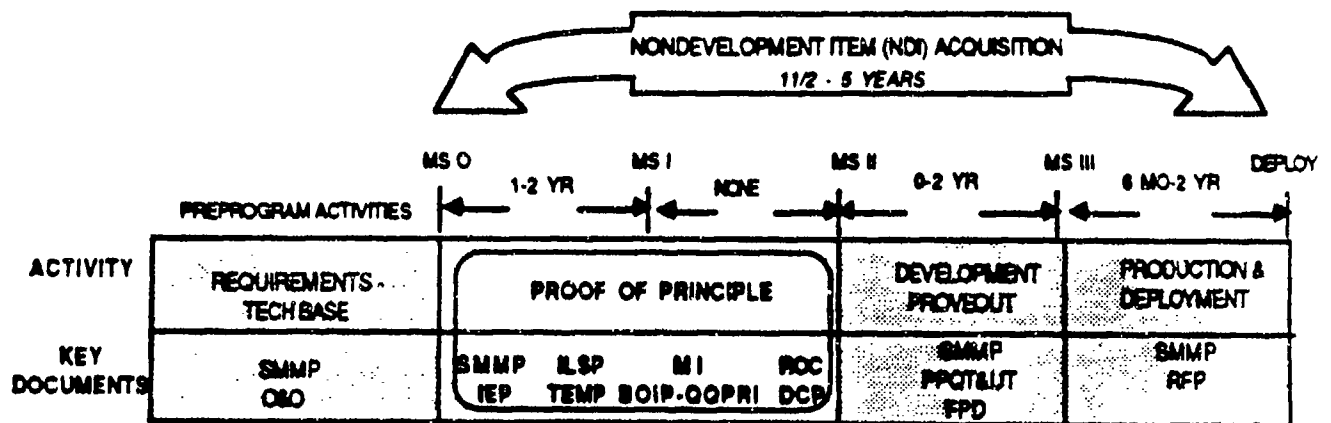


Figure 6-1--MANPRINT Related Documents during
Proof of Principle Activities

6.2 MANPRINT Responsibilities during Proof of Principle Activities

The responsibility for MANPRINT is shared between the combat developer and materiel developer throughout the life cycle. Each has a role to ensure total program success.

6.2.1 The Combat Developer.

In Proof of Principle, the combat developer (CBTDEV) continues to develop the soldier performance issues and integrates the results of early studies, analyses, and evaluations on the proposed system to refine the MANPRINT requirements.

6.2.2 The Materiel Developer.

The materiel developers' (MATDEV) role is to integrate MANPRINT

into the materiel development and acquisition process by ensuring that the identified soldier performance requirements are addressed in program, solicitation, and contractual documents. The MATDEV is also responsible for initiating MANPRINT related analyses (MANPRINT Assessment [formerly HFEA], HHA).

6.3 Developing MANPRINT

During Proof of Principle activities, MANPRINT is developed in response to the acquisition strategy and the system concept under consideration. Figure 6-2 depicts the development of MANPRINT during this period.

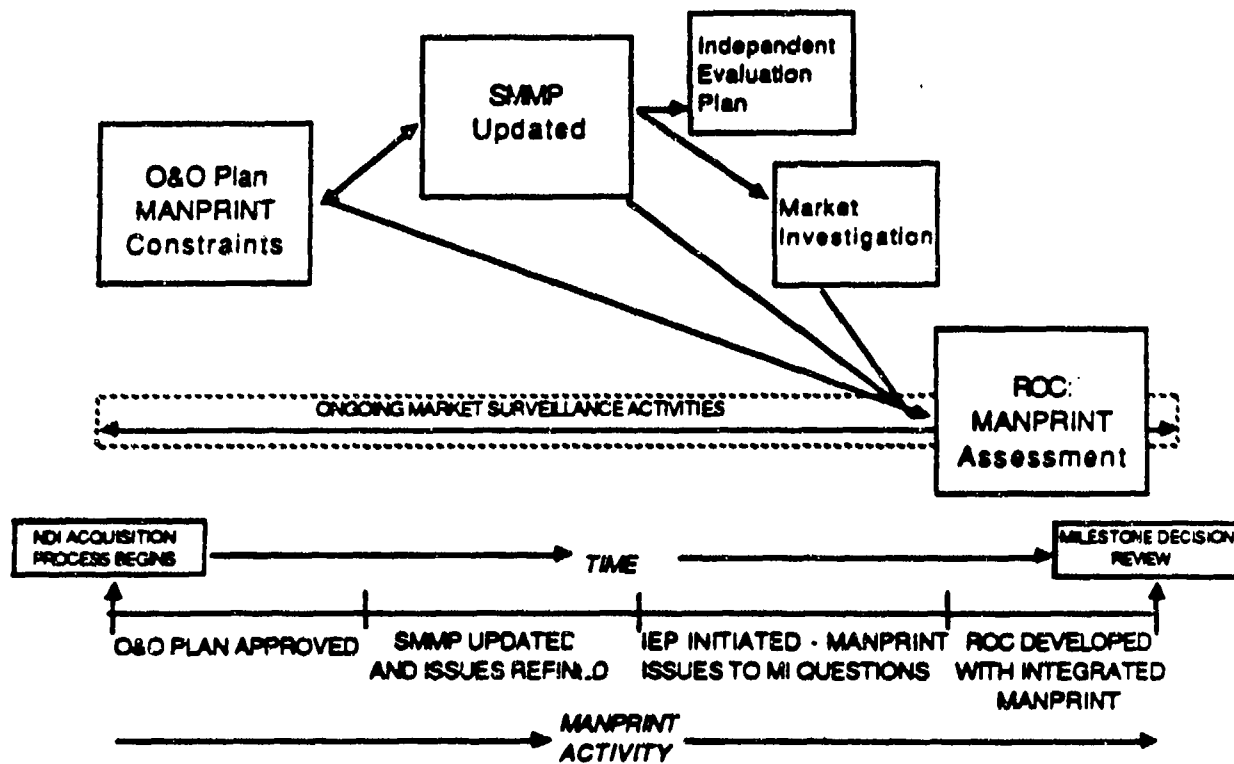


Figure 6-2--MANPRINT Development during Proof of Principle Activities

6.3.1 Acquisition Approach.

The acquisition approach is determined from Market Surveillance information and the Concept Formulation Package (CFP).

a. Market Surveillance.

1) The feasibility of an NDI approach is initially developed from information resulting from market surveillance activities.

2) Market surveillance is a systematic effort to gather information to identify technical and industrial capabilities to meet potential user identified requirements. Its purpose is to develop and maintain an awareness of marketplace products (applications of

current technology) and activities (technological trends) for potential Army use. The goal of market surveillance is to provide information pertaining to an individual program or PEO in conjunction with the preparation of the O&O Plan and CFP. AMC laboratories, RD&E Centers, and USASAC conduct on-going programs to maintain information currency such as attendance at trade shows, through journals, industry publications, IR&D reports and presentations, and other related activities. Market surveillance provides the knowledge base for beginning specific market investigations once an NDI strategy has been determined to be feasible. (See Reference 6g for detailed information on market surveillance.)

3) The AMC activities responsible for market surveillance programs need to be aware of MANPRINT and its related issues. There are formal MANPRINT training courses available through Soldier Support Center - National Capitol Region. However, it is ultimately the responsibility of the CBTDEV and MATDEV through long-range identification of potential programs to establish a MANPRINT sensitivity within the cognizant AMC organizations. Long range identification can be made through the Mission Area Materiel Plan (MAMP) process and affected technology base programs (and their related organizations) can be identified.

b. Concept Formulation Package (CFP).

The CFP establishes technical and economic specifications to satisfy the stated requirements. The CFP consists of the Trade-Off Determination (TOD), Trade-Off Analysis (TOA), Best Technical Approach (BTA), and Cost and Operational Effectiveness Analysis (COEA). The various techniques include both AMC and TRADOC evaluations of the technical approaches provided considering product improvements, NDI, and new development.

6.3.2 The System Concept.

The CFP documents the concept formulation effort. The TOD, TOA, and BTA are used to provide analytic rationale for and technical documentation of the system concept(s) which are candidates to satisfy the requirement. The COEA is used to document the selection of the preferred candidate based on cost and operational effectiveness.

6.4 The System MANPRINT Management Plan

6.4.1 Updating the SMMP.

As new information is developed, the SMMP is updated and issues are more clearly defined. At a minimum, the SMMP should be reviewed and updated prior to each MDR. The CBTDEV is the lead agent for the SMMP and must make the decision as to when to update, what information constitutes a significant change that requires update, and whether or not to convene the MJWG to review the new information. Information needs and analytical approaches are prioritized as resources and the acquisition approach limit time and capabilities.

6.4.2 Refining NDI MANPRINT issues.

In Chapter 4 (Paragraph 4-3 and Figure 4-4), the basic MANPRINT concerns relating system effectiveness, supportability and availability to soldier-machine, unit and total system performance were developed. Once an NDI strategy has been selected as an alternative approach to be considered, these generic performance concerns must be further defined and questions developed that support the soldier performance issues that are specific to the system being planned. The questions are tailored to develop necessary information to evaluate the available hardware compatibility with the soldiers described in the target audience description.

6.5 MANPRINT in Independent Evaluation Plans (IEP)

MANPRINT in the IEP focuses on defining system (soldier and equipment) performance issues for investigation and evaluation in determining if NDI can meet the users' needs. The issue development process in the SMMP provides the input for the IEP. It should be noted that MANPRINT issues primarily will be focused in the operational IEP, but safety and other domain areas can be evaluated in the technical IEP as well.

6.5.1 Army MANPRINT Questions.

Once the specific underlying MANPRINT performance constraints have been identified, they can be further refined through association with a set of generic MANPRINT questions. These questions provide the basis for evaluating MANPRINT compliance and should deal with the applicable areas within the matrix of basic issues (Figure 4-4) and be addressed in terms of the six MANPRINT domains. This will provide consistency in format between the System MANPRINT Management Plan (SMMP) and the requirement documents which address MANPRINT issues by domain. As a starting point for the user, a set of generic MANPRINT questions supporting each of the matrix positions is provided in Appendix A--Questions Supporting MANPRINT Concerns.

6.5.2 Tailoring Army MANPRINT Questions.

It is recognized that not all questions will be necessary or applicable to every NDI acquisition. The generic MANPRINT questions (Appendix A) provide a starting point so that questions that directly support the critical MANPRINT issues can be extracted. Tailoring of questions should be accomplished to elicit information that will allow an objective evaluation of the target soldiers' ability to operate, maintain, and support the equipment, the expected soldier performance, and projected system effectiveness as reflected in the basic MANPRINT issues. The example at the end of the chapter provides a sample of the tailoring process.

EXAMPLE**EXAMPLE EX-4 - TAILORING
ARMY QUESTIONS USING
APPENDIX A****(PAGES 6-13 to 6-14)****6.6 MANPRINT in the Market Investigation (MI)**

a. Heavy reliance is made on the Market Investigation and its findings to determine whether or not NDI is viable as an acquisition strategy (Are there commercial products available which meet user needs?) and to provide a basis for the finalization of the requirements document (What aspects of available hardware satisfy soldier performance requirements and should be incorporated in the ROC?).

b. The O&O Plan and both the technical and operational IEPs provide the basis for the MI. Development of questions which will gather information on the MANPRINT acceptability of marketplace products is the first step in influencing the MI process. MANPRINT questions are integrated in MI through embedding MANPRINT issues and concerns in the O&O Plan and through ensuring MANPRINT issues are addressed in the IEP.

c. In order for MANPRINT to influence the NDI decision, the MSC personnel conducting the MI should rely on the MANPRINT experts and coordinate their MI surveys and questionnaires through the MJWG. The MJWG should, in turn, ensure coordination with appropriate domain agencies (such as HFE issues with local HEL representatives, HHA issues with the local Preventive Medical Office) to assess the appropriateness of the questions and to ensure that identified issues (such as elimination of "high driver" tasks identified through the ECA) are addressed.

d. Similarly, the MI POC should work closely with the MJWG, domain experts, and the Technical and Operational Independent Evaluators to interpret and evaluate the answers and data provided by industry.

6.6.1 Industry MANPRINT Questions.

a. In developing industry MANPRINT questions for use in the MI, two criteria must be met: the questions must be relevant to the Army concerns and MANPRINT issues, and sufficiently meaningful to industry to elicit the desired information.

b. Appendix B--MANPRINT Questions for Market Investigation--lists twenty-two questions designed to provide a comprehensive starting point for users to modify or tailor to their system information needs.

6.6.2 Tailoring Industry MANPRINT Questions.

To tailor the MI questions requires an understanding of the relationship of the industry questions to both the MANPRINT performance issues and the MANPRINT domains.

a. Market Questions and MANPRINT Issues. The twenty-two MI questions were mapped against the six performance concerns previously discussed in Chapter 4 and presented in Figure 4-4. To accomplish this mapping, an analysis was made to determine which questions applied to which issues. Figure 6-3 presents the results of this analysis. Questions that are directly relevant to an issue are marked with an "X". Questions that indirectly impact on an issue are indicated by an "O". As can be seen from the analysis, the set of proposed market investigation questions provides coverage of the generic MANPRINT performance issues. (A related issue of "sufficiency" or "adequacy" of coverage will be discussed in subparagraph "d.", below.)

MARKET INVESTIGATION QUESTIONS	ISSUES					
	SYSTEM EFFECTIVENESS			SYSTEM SUPPORTABILITY		SYSTEM AVAIL
	S/M PERF	UNIT PERF	TOTAL SYS	S/M PERF	UNIT PERF	S/M PERF
1	X	O	O	X	O	O
2	X	O	O	X	O	X
3	X			X		X
4	X	O	O	X		X
5	X			X		X
6	X	O	O	X	O	X
7	X	O		X		X
8	X	X	X	X	X	X
9	X			X	O	
10	X			X		O
11	X			X	O	X
12	X			O		
13	X	X	O	X	O	X
14	X	O		X	O	
15	X	O	O	X	O	X
16	X			O	O	O
17	X	O	O	X	O	O
18	X	O	O	O	O	O
19	X	O	O	O	O	O
20	X			X	O	O
21	X	X	X	X	X	X
22	X	O	O	X	O	O
X - DIRECTLY APPLICABLE O - INDIRECTLY APPLICABLE						

Figure 6-3--Market Investigation Questions and MANPRINT Concerns

b. Market Questions and MANPRINT Domains. A similar analysis was performed to determine if the proposed Market Investigation questions gave coverage to the six MANPRINT domains. Figure 6-4 presents the results of this mapping and reflects the resultant coverage determined for each domain. (A related issue of "sufficiency" or "adequacy" of coverage will be discussed in subparagraph "d.", below.)

c. Mapping. Through these "maps", the user can determine which of the market investigation questions to ask or analyze in order to address or evaluate a particular MANPRINT concern. Following the discussion, an example of this process is shown.

1) Example - Performance Concerns (Figure 6-3). During the development of the SMMP, a concern is raised regarding how the proposed equipment would operate within the organization. Questions 8, 13, and 21 would provide information that could be used to determine if the unit would be able to perform all its functions and missions under operational conditions. Additional information regarding this issue could be obtained through questions 1, 2, 4, 6, 7, 14, 15, 17, 18, 19, and 22.

MARKET INVESTIGATION QUESTIONS	MANPRINT DOMAINS					
	MANPOWER	PERSONNEL	TRAINING	SYSTEM SAFETY	HEALTH HAZARDS	HUMAN FACTORS
1	X	X				X
2						X
3	X	X				X
4			X			
5	X	X	X			X
6	X	X	X			X
7	X	X	X			
8	X	X	X			X
9						X
10						X
11						X
12						X
13			X			
14			X			
15	X	X	X			
16				X	X	
17				X	X	
18				X	X	
19				X	X	
20				X	X	
21	X	X		X	X	
22				X	X	X

Figure 6-4 --Market Investigation Questions and
MANPRINT Domains

2) Example - Domain Concerns (Figure 6-4). From a review of safety lessons learned on the predecessor system, questions were raised and subsequently were developed as MANPRINT issues. The safety aspects of the proposed system can be determined by analyzing the responses to questions 16 - 22.

EXAMPLE

**EXAMPLE EX-5- TAILORING
INDUSTRY QUESTIONS
(PAGES 6-15 to 6-16)**

d. Selection of Questions for Issue Coverage. Selection of questions for use in the Market Investigation should be based on the identified system MANPRINT issues and concerns. Appendices A and B provide sample questions but are not intended to be all inclusive. Questions outside those listed may be more appropriate depending on the issues. The best source of guidance for question determination will be the collective expertise of the MANPRINT Joint Working Group.

6.6.3 Conduct of the Market Investigation.

Conduct of MIs may vary from informal telephone inquiries to comprehensive industry-wide reviews. MIs are normally conducted by the AMC commodity-oriented MSCs in two phases.

a. During the first phase, maximum use is made of available information such as contractor sources, user experience, independent tests, etc. MI information is consolidated and supplemented to determine the nature of available products and the number of potential vendors. Based on this preliminary investigation, a decision is made as to whether or not sufficient information exists to make the NDI decision or whether (and what) additional information is required to make a sound decision.

b. During the second phase, the required additional information is collected. This may include a request for information through advertising in the Commerce Business Daily or purchasing or leasing test samples or items to conduct operational and combat suitability tests such as Early User Test and Experimentation (EUTE).

6.6.4 Use of the MI Results.

a. The MI results are used to support a definitized NDI decision, finalize the appropriate requirement documents, and develop an acquisition strategy responsive to the requirements.

b. From a MANPRINT perspective, the MI results are used for making the MANPRINT acceptability assessment (See Chapter 9--MANPRINT Evaluation). This assessment is made based on the "generic" products available in the marketplace. It is particularly important that the features of the available hardware that support soldier performance requirements be integrated in the ROC as system specific requirements and that the MI results be included in the SMMP (Paragraph 2 - Man-in-the-loop characteristics, Tab F - Audit Trail, etc.).

6.7 MANPRINT in the Required Operational Capability (ROC)

A ROC is the Army's definitive statement describing the materiel solution to the identified deficiency. It concisely states the minimum essential operational, MANPRINT, training, logistic, technical, and cost information to initiate the acquisition of the materiel solution. An approved ROC and Milestone I/II or I/III decision to proceed commits the Army to acquisition of materiel.

6.7.1 ROC Initiation.

Like the SMMP and the O&O Plan, the ROC is developed and written by the TRADOC center or school assigned proponentcy for the system in coordination with all players appropriate to the program. The ROC is submitted for approval only when TRADOC and AMC agree that the need is still valid, the operational and technical feasibility of the system has been established, and the system is cost and operationally effective.

6.7.2 Integrating MANPRINT in the ROC.

MANPRINT issues and concerns should be resolved--either through positive responses from the MI, tradeoffs in user needs, or recognized modification requirements--and the SMMP updated by the time the ROC is initiated. Paragraph 8--MANPRINT Assessment--of the ROC provides details of the constraints, soldier-machine performance aspects, and other MANPRINT considerations by domain. Additionally, Paragraph 4--Operational Characteristics--should include integrated soldier performance statements in the required characteristics.

6.8 MANPRINT in Other Program Documents

The MANPRINT program seeks to optimize total system performance by integrating soldier performance considerations in the material acquisition process. In an NDI acquisition, the integration process does not differ. Integration is achieved by including consideration of MANPRINT in other program documents. NOTE: Specific guidance on how to execute MANPRINT in each document is not provided. Users are referred to Chapter References, Appendix D - References, and encouraged to contact Subject Matter Experts if more detailed information is required.

6.8.1 Test and Evaluation Master Plan (TEMP).

a. The TEMP is the major test and evaluation planning document and identifies all critical technical and operational issues. It is important to note that the TEMP represents a single, integrated test program and is prepared by the Test Integration Work Group (TIWG). The TIWG-TEMP process provides the interface between the TIWG and test requirements of all Army activities. (See Reference 6b and 6j.)

b. MANPRINT issues and evaluation criteria must be included in the TEMP. Test issues must address the soldier-machine aspects of performance, and tests should be designed to produce quantifiable

results. MANPRINT evaluation factors must likewise provide for measurable soldier-machine standards upon which to evaluate the acceptability of MANPRINT. While specific criteria and methodology for selecting MANPRINT issues for inclusion in the TEMP are not developed in this handbook, an example of MANPRINT test issues is shown at the end of the chapter.

EXAMPLE

**EXAMPLE EX-6- SAMPLE
MANPRINT TEMP ISSUES**

(PAGES 6-17 to 6-18)

c. TEMP annexes include the Master Evaluation Plan, the Independent Evaluation Plan (discussed in paragraph 6.5), and the Test Design Plan.

1) Master Evaluation Plan (MEP).

The MEP provides for a consolidated technical, operational, and independent evaluation of the system. The MANPRINT input should be reflected in the soldier performance standards and in how the evaluation of soldier performance will be accomplished.

2) Test Design Plan (TDP).

The TDP describes required testing, the conditions, and standards. The MANPRINT input is reflected in the conditions (how and where the test will be conducted--the environment--and numbers and types of soldiers to be used--manpower and person 1 considerations).

6.8.2 Integrated Logistics Support Plan (ILSP).

a. The ILSP describes the overall integrated logistical support requirements, tasks, and milestones for the immediate acquisition period, and projects ILS planning for succeeding phases.

b. MANPRINT is a total system approach and considers the performance capabilities and limitations of the operators, maintainers and supporters in determining the acceptability of hardware. ILS centers on the supportability and maintainability aspects of the system. Many of the MANPRINT performance issues will impact on the supportability of the system under consideration--such as manpower, personnel, and training--and must be integrated in the ILSP as shown in the following example. (See Reference 6e.)

**ILS Element
Maintenance Planning**

Establish specific criteria for: MANPRINT Integration

- | | |
|---|--|
| <ul style="list-style-type: none"> • Repair times • Repair levels • Maintenance tasks • Required manpower and grade levels • Interim support | <ul style="list-style-type: none"> • Include recognition of the maintainer aptitudes and training levels • Impact of number of tasks (workload) on soldier and optimize experience levels • Ensure tasks don't exceed available or achievable soldier capabilities • Manpower levels must be based on system constraints previously identified |
|---|--|

6.8.3 Basis of Issue Plan (BOIP).

The BOIP reflects the Manpower and Personnel requirements of the MANPRINT program. The BOIP delineates quantities of new systems, associated support items of equipment (ASIOE), and personnel. The personnel, manpower, and other requirements reflected in the BOIP are derived from the Qualitative and Quantitative Personnel Requirements Information (QQPRI). The manpower quantities reflected in the BOIP should be consistent with the manpower projections used in MANPRINT analyses.

6.8.4 Qualitative and Quantitative Personnel Requirements Information (QQPRI).

The QQPRI includes personnel quantity information, personnel changes, and Associated Support Items of Equipment (ASIOE). The personnel requirements should reflect the target audience used in developing MANPRINT. The ASIOE are a concern from a total system perspective due to the system impact of fielding delays or insufficient quantities to support the total system requirements.

6.8.5 The System Training Plan (STRAP) (Formerly called the Individual and Collective Training Plan [ICTP]).

a. The STRAP formalizes the proposed training strategy. It is the TRADOC proponent training developer's responsibility and incorporates all known training requirements (introduction, operator, maintainer, resident, unit, and extension). It contains the training concepts and resource estimates to support the training programs.

b. The MANPRINT aspects of the STRAP are numerous. In the total system consideration, training is a central domain due to its impact on other domains and soldier performance. The proposed training versus the aptitudes of the target audience, the impacts on manpower if training times are lengthened, and the impact on training to surmount potential safety and health hazards are some of the issues which must be addressed. (See Reference 6f.)

c. One area often neglected is the consideration of MANPRINT in the development or selection of training devices. A system training device is essentially an additional acquisition and may be more complex or employ different technologies than the hardware system it replicates. This area will be covered separately in Chapter 10.

6.9 Chapter References

FOR ADDITIONAL INFORMATION ON CHAPTER 6, REFER TO:

- 6a. AR 602-2, Manpower and Personnel Integration (MANPRINT) in the Materiel Acquisition Process
- 6b. AR 70-10, Test and Evaluation
- 6c. AR 71-2, Basis of Issue Plan (BOIP) and Qualitative and Quantitative Personnel Requirements Information (QQPRI)
- 6d. AR 71-3, User Testing
- 6e. AR 700-127, Integrated Logistic Support
- 6f. TRADOC-R 350-7, A Systems Approach to Training
- 6g. AMC-TRADOC PAM 70-2, Materiel Acquisition Handbook
- 6h. "The SMMP Procedural Guide", February 1987
- 6i. "The MANPRINT Primer", April 1987
- 6j. DA Pam 70-21, A Test and Evaluation Guide

EXAMPLE

REFER TO CHAPTER 1, PARA 1.5
FOR EXAMPLE BACKGROUND

Example EX-2 demonstrated an approach to developing the broad system concerns. Examples EX-3 followed the refining process as specific issues were identified and incorporated as system issues. The following example continues the process, building on the previously developed maintenance issue. (See references and process flow listed at example end).

Army Questions in support of MANPRINT issues provide a basis for information gathering and evaluation of MANPRINT compatibility in NDI. The maintenance issue started in Example EX-2 centered on Matrix Position 4. By crossreferencing to Appendix A, the generic questions associated with the system issue can be identified (see below). The questions are listed by MANPRINT domain to facilitate the tailoring process.

QUESTIONS SUPPORTING MANPRINT CONCERNS

ISSUE: SUPPORTABILITY (MATRIX POSITION 4)
SOLDIER-MACHINE INTERFACE: The probability that soldiers will be able to perform all maintenance tasks to standards under operational conditions.

MANPOWER:

What preventive maintenance tasks are required?
At what intervals?
How long do the tasks take to accomplish?
Are any tools, new tools or special tools required?
What materials are required?
Is a checklist available?
What operator repairs can be made?
What diagnostics are available to differentiate?
What materials are required?
Do operator repairs require additional personnel due to parts placement, task difficulty, etc.?

PERSONNEL:

Do target audience soldiers possess the aptitudes to perform operator maintenance?
Was the system designed for maintenance ease?
How complex are the repair tasks?
What other off-equipment tasks are the maintainers responsible for?

TRAINING:

What training is required to enable repair performance?
How complex are repair tasks?
How frequently will trained skills be called upon?

A-5

QUESTIONS SUPPORTING MANPRINT CONCERNS

Which required skills are compatible with current requirements?
What new training will be required?
What hazards are associated with the equipment repair that will require training?

SYSTEM SAFETY:

What hazards are associated with the equipment?
What cautions must be taken to avoid injury or damage to the equipment?
Is any protective or safety equipment required?
If so, is it available?

HEALTH HAZARDS:

Does the equipment contain any hazardous material?
What precautions have been taken to limit or eliminate exposure?
What protective equipment is required in handling?
Can the material interact with other agents to form hazardous/toxic substances?
Do repairs require the use of toxic or hazardous substances?
What precautions are required for use?
What special handling is required?

HUMAN FACTORS:

What are the mean times to deploy and recover?
Can soldiers dressed appropriate to the environment of interest operate and maintain the item?

A-6

Now, by referring to the O&O, you can select the appropriate questions required to support the individual system issues.

Page 1 of 2

NOTE: Highlighted issues will be carried through later examples to provide continuity of development.

FOR TRAINING PURPOSES ONLY

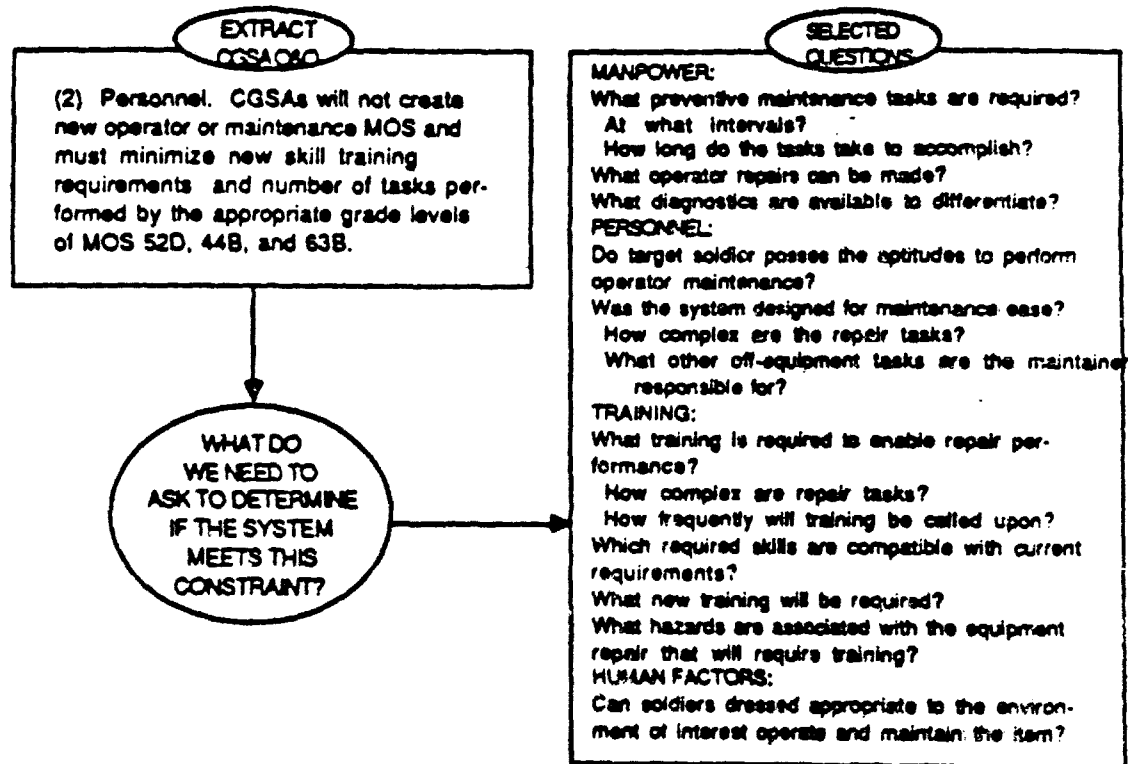
Example EX-4 -- Tailoring Army Questions

EXAMPLE

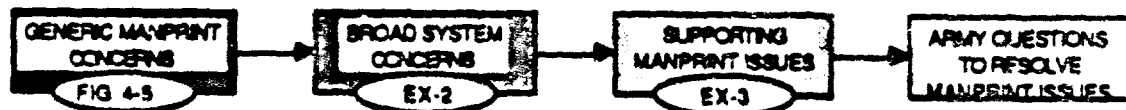
REFER TO CHAPTER 1, PARA 1.5
FOR EXAMPLE BACKGROUND

Note: The questions at Appendix A are not all-inclusive, but are designed to provide a starting point that should be built upon in relation to the system under consideration.

As an example, the following shows the development of the previously identified system constraint on personnel:



The development of Army Questions to support the IEP parallels the acquisition process - as the system concept becomes more refined, MANPRINT becomes more detailed. The following depicts the process with appropriate references for review.



Page 2 of 2

NOTE: Highlighted issues will be carried through later examples to provide continuity of development.

FOR TRAINING PURPOSES ONLY

Example EX-4 -- Tailoring Army Questions

EXAMPLE

REFER TO CHAPTER 1, PARA 1.5
FOR EXAMPLE BACKGROUND

Note: This is one approach to determining what questions industry must be asked in order for the Army to makean "NDI viable" determination. It is provided to show the mental process which is required and does not necessarily reflect the best or only way.

Once the Army questions have been identified, the next step is to make a determination of what type of data can we reasonably expect to gather from the marketplace. The questions, and resulting answers, fall into three areas--those Industry can answer, those which require Army and Industry answers and those which the Army must answer.

The following illustrates this process, using selected examples developed previously in Example EX-4.

**SELECTED
QUESTIONS****MANPOWER:**

What preventive maintenance tasks are required?
At what intervals?
How long do the tasks take to accomplish?
What operator repairs can be made?
What diagnostics are available to differentiate?

PERSONNEL:

Do target audience soldiers possess the aptitudes to perform all operator maintenance?
Was the system designed for maintenance tasks?
How complex are the repair tasks?
What other off equipment tasks is the maintainer responsible for?

TRAINING:

What training is required to enable repair performance?
How complex are repair tasks?
How frequently will the training be called on (Skill decay rate)?
Which required skills are compatible with current requirements?
What new skills will be required?
What hazards are associated with the equipment repair that will require cautionary or safety training?

HUMAN FACTORS:

How accessible are the components?
What integral diagnostics are available?

Questions that are solely equipment related based on design or reliability can be answered by industry.

Questions which involve the application of marketplace equipment must be answered by the Army based on industry information. In this example, you would have to compare who industry designed the equipment for with the Target Audience or compare the tasks with the current tasks being performed by the Target Audience.

Questions which are based on other aspects of soldier performance and the impact on total system performance will have to be answered and evaluated based on Army information.

Once the filtering process has been accomplished, then the industry questions can be developed based on information needs and included in the Market Investigation.

Page 1 of 2

NOTE: Highlighted issues will be carried through later examples to provide continuity of development.

FOR TRAINING PURPOSES ONLY

Example EX-5 -- Tailoring Industry Questions

EXAMPLE

REFER TO CHAPTER 1, PARA 1.5
FOR EXAMPLE BACKGROUND

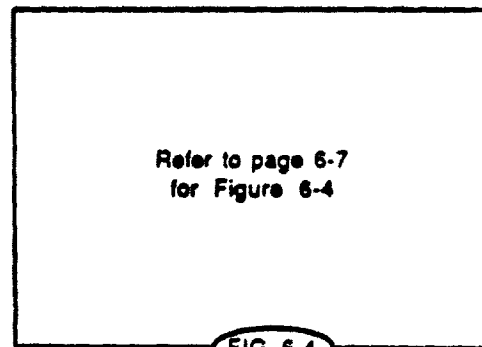
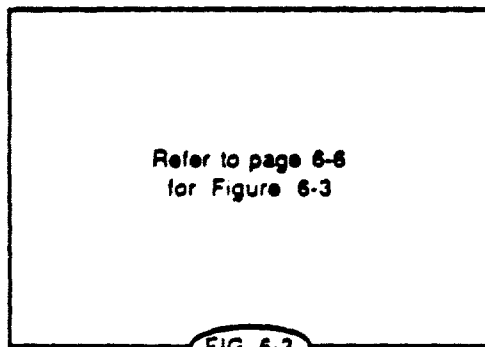
Once the potential marketplace questions have been identified, the next step is to ensure that the questions are relevant and understandable to industry so that the responses they provide can be used to evaluate the product from a MANPRINT perspective.

Appendix B--MANPRINT Questions for the Market Investigation--provides an initial list of questions which can be tailored or modified for use. Keys for success include elimination of Army peculiar "jargon" and acronyms and abbreviations such as :



Note: The questions at Appendix B are not all-inclusive, but are designed to provide a starting point that should be built upon in relation to the system under consideration.

Figures 6-3 and 6-4 provide a general guide for selecting appropriate questions and for evaluating the responses by system issue or MANPRINT domain.
(Refer to text [Pages 6-5 and 6-6] for discussion of use).



Page 2 of 2

NOTE: Highlighted issues will be carried through later examples to provide continuity of development.

FOR TRAINING PURPOSES ONLY

Example EX-5 -- Tailoring Industry Questions

EXAMPLE

REFER TO CHAPTER 1, PARA 1.5
FOR EXAMPLE BACKGROUND

The Test and Evaluation Master Plan (TEMP) lays out the proposed testing to be conducted and the evaluation criteria to be used throughout the acquisition. While one of the advantages of an NDI acquisition strategy is reduced procurement time, and minimum testing is a goal to support that end, NDI does not automatically equate to no testing.

The following demonstrates how MANPRINT issues can be addressed through testing.

(Refer to text [Para 6.7.1] for a discussion on the TEMP and Chapter 8 for more detail on testing in NDI)

**TEST AND EVALUATION MASTER PLAN (TEMP)
FOR
COMMERCIAL GENERATOR SET AND ASSEMBLAGES (NDI)**

Requirement Document: ROC, 30 Jan 1987,
Quiet, Reliable Generator Sets, Power Units, and Power Plants

TIWG
CONCURRENCE COPY
February 1987

PART I - DESCRIPTION

1. Mission of System.
2. System Description.
3. Required Operational Characteristics.

The required operational characteristics of the CGSA derived from the Required Operational Capability (ROC)...are described below.

- a. The CGSA shall not require the development of additional manpower requirements relative to existing standard generator sets.
- b. The CGSA shall be operable and maintainable by the same MOS and personnel now operating and maintaining existing generator sets.
- c. The CGSA shall comply with noise limitation specifications cited in MIL STD 1474, TB-MED-501, and AR 40-5.

The TEMP is written by the Test Integration Working Group (TIWG) and contains representation from the Materiel Developer, Combat Developer, Operational Tester, Operational Independent Tester, Technical Tester, and Logistician to provide a comprehensive plan to address all the interrelated issues associated with the acquisition.

*Part I contains an overview of the system: its mission, description, operational and technical characteristics and critical T&E issues.
NOTE: The required operational characteristics are derived from the ROC, emphasizing the importance of the crosswalk of documents.*

The basis for addressing MANPRINT issues in the TEMP is incorporating MANPRINT in the ROC and IEP. For MANPRINT to be tested and evaluated, it must be included as a required characteristic.

Page 1 of 2

NOTE: Highlighted issues will be carried through later examples to provide continuity of development.

FOR TRAINING PURPOSES ONLY

Example EX-6--MANPRINT in the Test and Evaluation Master Plan (TEMP)

EXAMPLE

REFER TO CHAPTER 1, PARA 1.5
FOR EXAMPLE BACKGROUND

d. The CGSA must be capable of being operated and maintained by 5th through 95th percentile soldiers wearing standard battle dress, and arctic and MOPP IV protective garments.

4. Required Technical Characteristics
(Omitted)

PART IV OPERATIONAL T&E OUTLINE

1. Critical Operational T&E Issues

Phase II of the CGSA program consists of the following to all Corps and Division headquarters. These CGSA will be subjected to a user evaluation to be conducted....These issues are summarized below (Selected MANPRINT examples):

a. Does the training program adequately prepare representative soldiers to use and maintain the CGSA in an operational environment? This issue addresses the adequacy of the training program.

b. Can the personnel selected to operate and maintain the CGSA perform required duties? This issue addresses the requisite aptitudes of the target audience soldier to develop required skills.

The critical MANPRINT issues reflect the issues previously identified in the SMMP. There must be a deliberate attempt to ensure consistency throughout all the documents with the SMMP providing the central management for MANPRINT.

Technical characteristics can be used to define the hardware physical characteristics such as weight, size, etc., needed to ensure target audience compatibility (strength, portability, etc.)

The Test Plan will lay out the details of how the test will be conducted to include standards and conditions.

The essence of MANPRINT in the TEMP is to structure the issues and criteria so that the soldier performance contribution can be assessed as a part of the system performance. Developing testable issues and criteria that can provide measurable soldier performance results is one of the challenges of MANPRINT in NDI. Given the NDI goal of minimizing testing and, for the most part, a predetermined design, the results of any operational testing performed will be extremely important in selecting the hardware configuration that is most consistent with the capabilities and limitations of the target audience soldiers.

Page 2 of 2

NOTE: Highlighted issues will be carried through later examples to provide continuity of development.

FOR TRAINING PURPOSES ONLY

Example EX-6--MANPRINT in the Test and Evaluation Master Plan (TEMP)

CHAPTER 7 MANPRINT EVALUATION AT NDI MILESTONE DECISION REVIEWS

7.1 Milestone Decision Reviews in NDI

7.1.1 Levels of Review.

Depending on the designation of proposed NDI procurement program--DoD Major, Designated Acquisition Program (DAP), or In-Process Review (IPR) Program--three levels of review are possible. (See Reference 7a for complete discussion.)

a. The Defense Acquisition Board (DAB)--formerly the Joint Requirements Review Board (JRRB)--provides recommendations to the Secretary of Defense on DoD Major Programs.

b. The Army Systems Acquisition Review Council (ASARC) develops the basis for decisions on Designated Acquisition Programs.

c. The In-Process Review (IPR) makes recommendations to the appropriate decision authority for all other programs.

7.1.2 Milestone Decision Reviews.

a. Milestone Decision Reviews occur at the end of each acquisition phase to review program progress and make a determination on whether or not to proceed.

b. As discussed, one of the major advantages of NDI is the time savings in fielding new systems. Due to the accelerated acquisition time, combined milestone decisions are used. If the results of the MI indicate that an NDI solution is viable, the AMC commodity-oriented MSC or appropriate PEO or PM initiates development of an NDI Acquisition Strategy (AS). The AS includes the decision to proceed to a combined Milestone I/III decision for procurement or Milestone I/II and initiation of Development Proveout activities.

c. The NDI decision is made at the initial milestone decision review--MS I/II for NDI Category B or MS I/III for NDI Category A.

7.2 MANPRINT Evaluation

Special attention must be given to the evaluation of MANPRINT in determining the feasibility of NDI as an acquisition approach. The consideration of soldier performance factors and their effect on total system performance remain central to the goals of MANPRINT. From a Nondevelopmental Item (NDI) perspective, the focus of implementing MANPRINT is on acceptability (Category A NDI) or modification (Category B and NDI Integration) of a system, rather than on influencing system design.

7.3 NDI Decision Factors

In determining if NDI is viable as an acquisition strategy, several factors are used to evaluate the potential of NDI to meet Army needs. (Reference 7a.) MANPRINT should be considered both integrally with other factors as well as a separate factor.

7.3.1 User Requirements.

NDI must satisfy the user needs as defined in the approved requirement documents. Stating user needs as system performance statements (soldier-in-the-loop) rather than focusing solely on equipment capabilities will ensure performance requirements are clearly understood.

7.3.2 Life Cycle Cost.

The advantages of NDI - quicker fielding and lower costs - must be evaluated for the various alternatives in terms of risk and cost tradeoffs. Selection should be based on the alternative with the lowest projected life cycle cost within acceptable risks that meets the user requirements. While MANPRINT is not a cost reduction program, it may reduce life cycle costs by "doing it right the first time". Systems selected or influenced by the MANPRINT program will meet performance standards and be compatible with the identified operators, maintainers, and support personnel. This will reduce the need for later modifications or support for unforeseen manpower or personnel demands.

7.3.3 Operations and Support.

Due to the short lead times for acquiring and fielding NDI, the Army's ability to provide adequate ILS to the materiel must be considered in the risks and costs. Factors such as interim contractor support (ICS) or contractor logistics support (CLS) must also be considered in relation to the intended use of the materiel. By integrating MANPRINT in the ILS planning, the soldier supportability issues can be addressed and the total logistical impacts of a new system better identified.

7.3.4 Availability.

Availability of the product and its associated spare parts must be considered. During the MI, the manufacturer's history, production capability, and ability to provide compatible spare parts must be assessed in arriving at an NDI decision.

7.3.5 NBC Survivability Requirements.

From an NBC survivability standpoint, if the item is vulnerable to the effects of NBC contaminants or decontaminating agents or, if the item is not operable by soldiers in MOPP IV gear, the equipment may not be suitable for battlefield use.

7.3.6 Threat Consideration.

Any decision to select an NDI solution to resolve a battlefield deficiency must include an evaluation of the item's vulnerability and survivability to the identified threat.

7.3.7 MANPRINT.

a. Early in the NDI process, MANPRINT must be a major factor in determining whether NDI can be fielded as a Category A item, whether modifications are required, or whether NDI is a viable solution at all.

b. Crucial to MANPRINT in the decision process is the concept that a *MANPRINT failure is a system failure*. If soldiers cannot perform to standards or are exposed to unacceptable safety or health risks, then the desired system performance and effectiveness cannot be achieved. Without modification to the materiel or the user requirements, MANPRINT is a "show-stopper" and an alternative acquisition strategy is appropriate.

7.4 MANPRINT Evaluation Process

a. The precise form of the MANPRINT acceptability analysis to be conducted as part of the NDI acquisition decision will vary with each procurement depending on the complexity of the system being evaluated and the evaluation strategy.

1) System evaluation is dependent on clearly defined criteria. Criteria are expressions of the required operational levels of system--soldier and equipment--performance.

2) Criteria are developed keyed to one of three basic evaluation strategies: comparison of the new system to the one being replaced; comparison of the new system to a predetermined standard; or determination of the overall unit or individual performance increase by the addition of the new system compared to not having the system.

b. Each evaluation, however, will share the same goals and potential outcomes. This generic evaluation process is illustrated in Figure 7-1. The ultimate goal of the analysis is to determine if the proposed NDI will meet performance--both soldier and technical--and supportability requirements. The effectiveness of the system--how well it resolves the battlefield deficiency--is directly linked to performance and supportability issues.

c. The MANPRINT evaluation process can be divided into three areas: System MANPRINT Requirements; System MANPRINT Compatibility; and, System MANPRINT Tradeoffs.

7.4.1 System MANPRINT Requirements.

Prior activities--such as front-end analysis, ECA, etc.--

determined the system specific operational performance issues which were developed as MANPRINT issues and addressed in the Market Investigation. Chapters 4 and 5 discussed the development of issues and the tailoring process for constructing MI questions. Well defined MANPRINT issues and concerns are central to meaningful evaluation.

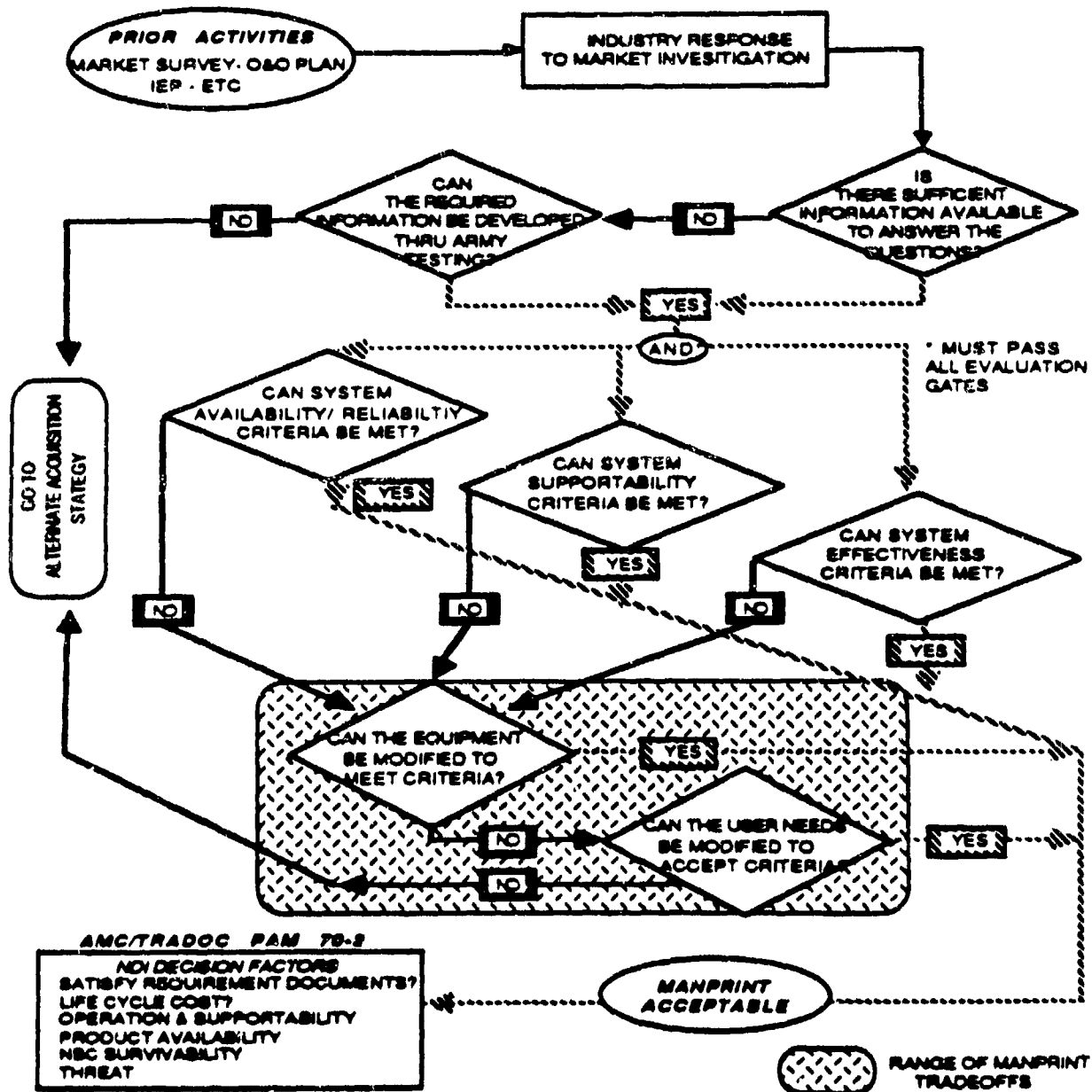


Figure 7-1--MANPRINT-NDI Evaluation Process

7.4.2 System MANPRINT Compatibility.

a. Data Collection. The majority of information available in making a determination of system compatibility with MANPRINT requirements will be derived from responses to the Market

Investigation. The initial step in the evaluation process is to determine whether or not sufficient information has been received to be able to provide objective answers to the issue-driven questions. If the MI information is insufficient, a decision must be made whether or not to acquire additional information through other sources (expand the Market Investigation) or Army testing, or to seek an alternate acquisition strategy. This decision must be based on the costs and risks associated with each approach. Expanding the Market Investigation will entail delays in the program and costs in terms of man-hours and must be balanced against realistic expectations of being able to collect the needed information. Army testing involves the same risks on an expanded scale.

b. Data Evaluation. Provided that sufficient information is generated from the MI or through Army testing, the basic soldier performance issues identified as input to the IEP form the basis for evaluating the acceptability of the system. Central to this evaluation process will be the linkages established between the MI questions and the MANPRINT issues and domains. Specific issues can be addressed by analyzing the information from related MI questions.

7.4.3 System MANPRINT Tradeoffs.

NDI capitalizes on flexibility and tradeoffs to take advantage of current technology, cost savings, and time. As the evaluation of the MANPRINT issues proceeds, potential hardware and operational software modifications to meet Army requirements or modification of user needs are realistic options that must be considered. Additionally, interchangeability issues--i.e., "new and improved" later versions that may retain the same model number but incorporate a different design and no longer interface with Army equipment--may impact on long-term procurements. Care must be taken to provide a complete evaluation of not only the strengths and weaknesses of a system, but also the potential tradeoffs and potential performance impacts so that an informed decision can be made on system MANPRINT acceptability. A simplified example is provided at the end of this chapter.

EXAMPLE

EXAMPLE EX-7--SAMPLE MANPRINT EVALUATION

(PAGES 7-7 to 7-8)

7.5 MANPRINT Acceptability

Once MANPRINT acceptability of generic systems has been accomplished, the features of potential NDI materiel that are consistent with the Army's MANPRINT requirements should be incorporated within the ROC as system requirements. Any modifications to user needs should also be captured in the updated requirements document. Additionally, proposed modifications to the materiel that were deter-

mined to be feasible should be incorporated in any subsequent NDI solicitation documents. In this manner, MANPRINT performance requirements become an integral part of the NDI acquisition.

7.6 Chapter References

**FOR ADDITIONAL INFORMATION ON
CHAPTER 7, REFER TO:**

- 7a. AMC-TRADOC PAM 70-2, Materiel Acquisition Handbook
- 7b. AR 602-2, Manpower and Personnel Integration (MANPRINT) in Materiel Acquisition Process
- 7c. "Handbook for Development of MPT Elements in the MANPRINT Assessment", Final Draft - July 1988.
- 7d. "Handbook for Quantitative Analysis of MANPRINT Considerations in Army Systems", June 1986.
- 7e. "MANPRINT in the Source Selection Process", Draft - December 1986.

EXAMPLE

REFER TO CHAPTER 1, PARA 1.5
FOR EXAMPLE BACKGROUND

The following is a simplified example of the evaluation process to determine the acceptability of an NDI product from a MANPRINT perspective.

Situation:

One of the applications for the CGSA 1.5KW generator is to power a Multispectral Close Combat Decoy (MCCD). The MCCD is a one man erectable, two-dimensional replication of a tank or combat vehicle. It consists of an expandable frame, a canvas skin, a power source, and a control box. The skin is shaped to the vehicle outlines and incorporates a graphic representation of the vehicle for the visual signature and a embedded heating element to produce a realistic thermal signature.

The Market Investigation (MI):

From the MI, it has been determined that several available hardware systems meet most of the generic requirements--as stated in the O&O Plan--for the CGSA program. In response to one of the MANPRINT identified questions concerning the 1.5KW generator, the following information was gathered:

**O&O Plan Extract -
System Constraints**

The 1.5 KW version shall not weigh more than 56 pounds in its operational configuration less fuel.

**Market Investigation
Responses**

The weight of the 1.5KW generator ranges from 68 to 96 pounds dry weight. The requirement to ruggedize for field use would add approximately 5 pounds. The weight of oil and trapped fuel would increase the total weight by 3 pounds.
Available weight: 76-104 pounds

The Evaluation Process:

Factor:

1. Can the equipment be modified to meet the criteria?

Consideration:

A review of the responses and literature indicate that current technology will not support significant weight reduction.

One response did propose a modification that would provide the generator as an assemblage--the motor and the generator as separate sections--each weighing less than 56 pounds.

PAGE 1 of 2

NOTE: Highlighted issues will be carried through later examples to provide continuity of development.

FOR TRAINING PURPOSES ONLY

Example EX-7--Considerations in Evaluating MANPRINT

EXAMPLE

REFER TO CHAPTER 1, PARA 1.5
FOR EXAMPLE BACKGROUND

Factor:

2. Can the user's needs be modified to accept the available hardware?

Potential Trade-Offs

Trade-off

MANPOWER: Use two soldiers to off-load and setup the MCCD power source.

PERSONNEL: Use dedicated MCCD trained soldier--New ASI or MOS--Require MEPSCAT rating of Very Heavy.

EQUIPMENT:

- Change strategy from NDI Category B to Other--Explore two-part generator feasibility.
- Add support equipment such as a sling or winch device to the M60 to allow loading and recovery.

Consideration:

The weight limit of 56 pounds resulted from the projected employment of the MCCD. The MCCD will be carried on the " " rack of the M60 Tank and 56 pounds is the weight limit established for the 5 - 95th percentile male for lifting weight overhead.

Potential Impact

Takes an additional soldier away from M60 tasks during employment and recovery.

Potential for personnel shortages due to increased recruiting difficulties. Training impact of new MOS or ASI.

May breach other requirements such as system set-up time, maintainability, reliability. Increased costs.

Training impact. Impact on maintainer (who?)

From the evaluation process, the acceptability of a product can be determined based on the consideration of hardware conformance to constraints and goals, and potential performance impacts or, in simpler terms: *What's possible versus what's reasonable?*

One Solution: The decision authority evaluated the alternatives as follows:

MANPOWER: Using two soldiers was considered a reasonable solution but, due to other mission tasks which would be conducted concurrently, it was not a desirable solution.

PERSONNEL: The personnel options were not considered reasonable due to the impact they would have on the total force.

EQUIPMENT: Additional support equipment was not considered a reasonable solution since it would add additional maintenance and operator tasks which could not be accommodated.

EQUIPMENT: The decision was made to explore the two-part generator concept. A prototype was contracted for as an NDI Integration using standardized components with modification to be tested in a user environment. As an interim measure, user testing would proceed using two soldiers.

PAGE 2 of 2

NOTE: Highlighted issues will be carried through later examples to provide continuity of development.

FOR TRAINING PURPOSES ONLY

Example EX-7--Considerations in Evaluating MANPRINT

CHAPTER 8 MANPRINT APPLICATIONS DURING DEVELOPMENT PROVEOUT ACTIVITIES

8.1 Overview: MANPRINT during Development Proveout Activities

Development Proveout activities are conducted in the NDI procurement process only when called for by the Acquisition Strategy and approved at the Milestone Decision Review. The Acquisition Strategy addresses tailoring of the acquisition process and describes specific events and criteria to be met for Milestone decisions including MANPRINT. Development Proveout activities are normally associated with NDI Type B and NDI Integration procurements.

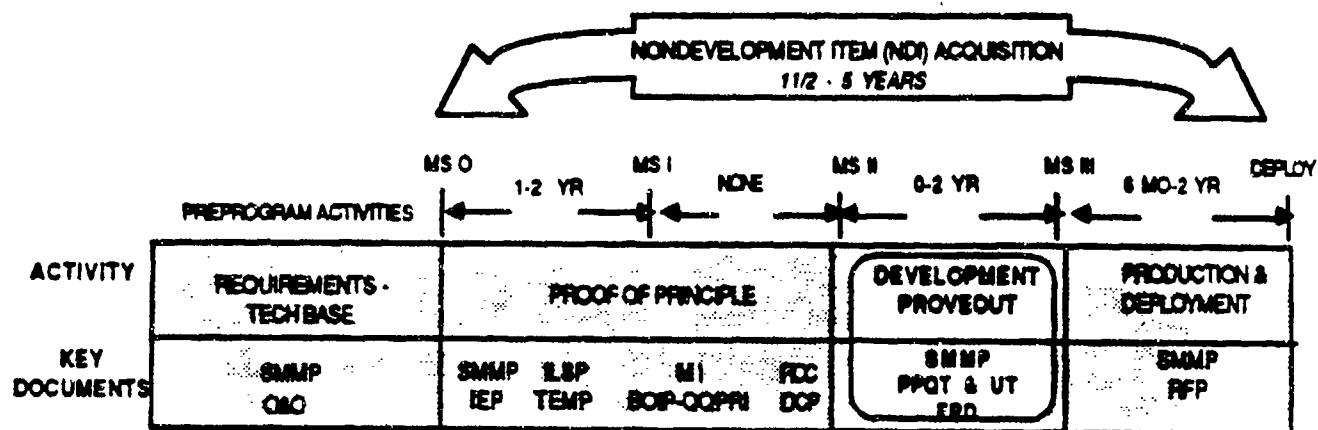


Figure 8-1--MANPRINT Related Documents and Activities during Development Proveout

During this period of the NDI procurement cycle, MANPRINT applications are focused on Preproduction Qualification Testing (PPQT), User Testing (UT), and the preparation of formal specifications in the Functional Purchase Description (FPD).

8.2 The System MANPRINT Management Plan

During Development Proveout, the SMMP provides source information on MANPRINT issues and concerns that have not been resolved up to this point. It provides a starting point for identifying issues that should be addressed in PPQT and UT. Additionally, the SMMP documents identified hardware characteristics--determined in the MI--that are compatible with the target soldier's capabilities and will enhance soldier performance. These hardware features should be included as required characteristics of the system in the FPD.

8.3 MANPRINT Applications in Testing

An updated TEMP (to include MANPRINT issues) will be developed by the TIWG for Development Proveout activities. (This is a

continuation of the TIWG-TEMP process started during Proof of Principle activities and will continue through production testing.) A basic fact is that if a desired or required test is not in the TEMP, it probably won't be done.

8.3.1 NDI Testing.

NDI testing requirements are tailored to each specific system and Type NDI category. The following are general guidelines that provide general characteristics of testing activities appropriate to each NDI category. The goal of minimum testing still remains regardless of category. (See Reference 8a.)

a. NDI Category A. No testing should occur prior to Production Qualification Testing (PQT), except when the contract is awarded to a contractor who has not previously produced an acceptable product and the item is assessed as high risk. In that case, PPQT should be required.

b. NDI Category B. Feasibility testing is required in the military environment. PPQT is required if feasibility testing results in fixes to the item. PQT is required. Limited user evaluations may occur during feasibility-preproduction tests.

c. NDI Integration. Feasibility testing is required in the military environment. PPQT of the complete system is required. Hardware and computer software integration tests are required. PQT is required.

8.3.2 Preproduction Qualification Testing (PPQT).

a. PPQT are formal tests performed by the contractor that ensure that the hardware is functional within the specified operational and environmental range. These tests usually use preproduction hardware fabricated to the proposed production design specifications and do not include typical soldiers. Such tests include contractual demonstration tests required prior to production release.

b. If the independent evaluator determines that the MI did not provide sufficient information to address all the MANPRINT issues or the affects of equipment modifications in support of MANPRINT require validation, MANPRINT test issues should be included in PPQT and soldiers should be included, under contract terms, in operational testing.

c. MANPRINT test issues must be jointly developed by the Test Integration Work Group (TIWG). Tests must be accurate, provide quantitative (measurable) results that address the issues, and most importantly, treat MANPRINT failures as system failures.

8.3.3 User Testing (UT).

a. The decision whether or not to conduct user testing in an

NDI acquisition is made jointly by AMC and TRADOC based upon information, gathered through the MI, that the NDI product will satisfy the requirement document (O&O or ROC).

b. User testing is conducted to determine the soldier acceptability aspects of materiel, operational effectiveness, and suitability of materiel in the tactical environment. From a MANPRINT perspective, user testing provides the best opportunity to gather quantitative information for resolving MANPRINT issues and determining total system performance.

c. Unlike PPQT, which is hardware oriented, UT provides a greater ability to determine the soldier influence on system performance. For this reason, UT should be conducted under conditions that simulate the projected environment under which employment is envisioned.

8.3.4 Evaluation.

Independent evaluation is performed on both technical and operational test results.

a. Technical evaluation. The U.S. Army Materiel Systems Analysis Agency (AMSAA) is the technical independent evaluator and Test and Evaluation Command (TECOM) is the technical independent assessor. The evaluator handles the major, designated acquisition, and ancillary systems and the assessor handles the rest.

b. Operational evaluation. The operational independent evaluator is provided by the Operational Test and Evaluation Agency (OTEA), the Combined Arms Center (CAC), or the proponent - depending on the type system.

8.4 Functional Purchase Description

a. Purchase descriptions are governed by the Federal Acquisition Regulations (FAR) [See Reference 8g]. The FPD identifies the essential elements to be included in the solicitation document (RFP, RFQ, etc.). It describes the minimum essential physical, functional, and other characteristics of hardware and software necessary to meet the stated requirements. FPDs describes what, if any, production testing must be performed and, of importance to MANPRINT, logistics and maintenance support provisions, training support, technical manual and training material needs, configuration change control, and special conditions as appropriate. *An FPD differs from a specification in that specifications include the criteria for determining whether or not the requirements are met.* (For further clarification, see paragraph 9.4.2, next chapter, for System Specification and Statement of Work.) With an NDI acquisition, the ability of available hardware to satisfy requirements has been predetermined.

b. Purchase descriptions may be stated in terms of function, so that a variety of products may qualify, or performance, including

specifications of the range of acceptance characteristics or of the minimum acceptable standards. When preparing a purchase description, the following characteristics may be included [See Reference 8g]:

- (1) Common nomenclature
- (2) Kind of materiel
- (3) Electrical data, if any
- (4) Dimensions, size, or capacity
- (5) Principles of operation
- (6) Restrictive environmental conditions
- (7) Intended use, including-
Location within an assembly
Essential operating condition
- (8) Equipment with which the item is to be used
- (9) Other pertinent information that further describes the item or materiel required.

c. The Functional Purchase Description can serve as the solicitation document or provide the nucleus for the development of a solicitation document--such as an RFP--in more complex NDI acquisitions. The approach to inserting MANPRINT in the FPD is to orient on the total system information gathered during Requirements-Tech Base-Proof of Principle activities when describing the minimum essential physical, functional, and other characteristics necessary to meet the stated requirements. Required characteristics must be described in terms of soldier-machine-environment performance statements as shown below.

Example Requirement:

One person must be able to change the oil and filter in 20 minutes.

Better--specifies the soldier and the standard.

The target operator must be able to change the oil and filter in 20 minutes.

Best--specifies the soldier, the performance standard, and the operational conditions.

A trained, target operator must be able to change the oil and filter in not more than 15 minutes in a field environment and in not more than 20 minutes under simulated NBC conditions wearing MOPP IV protective clothing.

b. An example of a Functional Purchase Description describing MANPRINT considerations is shown at the chapter end.

EXAMPLE

**EXAMPLE EX-8--SAMPLE
MANPRINT IN THE
FUNCTIONAL PURCHASE DESCRIPTION
(PAGES 8-6 to 8-7)**

8.5 Chapter References

**FOR ADDITIONAL INFORMATION ON
CHAPTER 8, REFER TO:**

- 8a. AMC-TRADOC PAM 70-2, Materiel Acquisition Handbook**
- 8b. DODD 5000.3, Test and Evaluation**
- 8c. AR 70-10, Test and Evaluation**
- 8d. AR 71-3, User Testing**
- 8e. AR 602-2, Manpower and Personnel Integration (MANPRINT) in Materiel Acquisition Process**
- 8f. CSR 71-3, Operational Testing and Evaluation Methodology and Procedures Guide**
- 8g. Federal Acquisition Regulation (FAR), Part 10--Specifications, Standards, and Other Purchase Descriptions**
- 8h. DA Pam 70-21, A Test and Evaluation Guide**

EXAMPLE

REFER TO CHAPTER 1, PARA 1.5
FOR EXAMPLE BACKGROUND

The Functional Purchase Description is formulated based on hardware and software characteristics that have been verified as being available in the marketplace. It is important to note that purchase descriptions may not be written so as to specify a product, or a particular feature that is unique to one manufacturer, unless it is determined that the particular feature described is essential to the Government's requirement. The following example highlights the MANPRINT aspects that may be incorporated in the purchase description.

**COMMERCIAL GENERATOR SETS AND ASSEMBLAGES (CGSA)
MANPRINT CONSIDERATIONS IN THE
FUNCTIONAL PURCHASE DESCRIPTION**

APPLICABLE MILITARY STANDARDS:

MIL-STD 882 System Safety Program Requirements
MIL-STD 454 Standard General Requirements for
Electronic Equipment
MIL-STD 1472 Human Engineering Design Criteria
for Military Systems
MIL-STD 1474 Noise Limits for Army Materiel

TEST:

PPQT/FAT - Protector tests, Instrument Accuracy, Mal-
function indicator, Noise, Safety Release

RELIABILITY:

OTHER (Human Performance and Support)

NOISE: 70dba at 7 meters; 85 dba at operator's position.

The use of military standards (established engineering practices and technical limitations) is allowed for use in conjunction with specifications, invitations for bid, requests for proposals, and contracts. If the purchase description is to be used in lieu of other contracting documents, no standards should be cited.

While testing is minimized, if a requirement exists for first article tests (FAT), selected MANPRINT information can be verified.

The reliability requirements can require testing. The operator-maintainer should be factored in to the failure definition and reliability assessment.

Describe the equipment performance requirements in terms of the impact on the soldier.

Page 1 of 2

NOTE: Highlighted issues will be carried through later examples to provide continuity of development.

FOR TRAINING PURPOSES ONLY

Example EX-8--MANPRINT in the
Functional Purchase Description

EXAMPLE

REFER TO CHAPTER 1, PARA 1.5
FOR EXAMPLE BACKGROUND

CLOTHING: Use of arctic and MOPP gear: Direct operator/maintenance contact for 20 min per 8 hours of operation in MOPP IV.

OPERATION & MAINTENANCE:

A trained, target operator must be able to change the oil and filter in not more than 15 minutes in a field environment and in not more than 20 minutes in a simulated NBC environment wearing MOPP IV protective gear.

The target operators must be able to detect all system maintenance faults and determine the probable cause with 90 percent accuracy within 10 minutes.

Target maintainers must be able to perform all organizational level repairs within 40 minutes; 1 hour in an NBC environment in MOPP IV protective gear.

95% of target maintainers must be able to deploy, operate, and recover the system.

DESIGN:

Commonality of parts, wiring diagrams, engines, etc.

(Impacts on training)

Standardized output terminals, markings, etc.

(Impacts on training/safety)

Controls:

Centralized on one panel (Ease of operation)

Secure lighting (Vulnerability)

The FPD describes the minimum essential requirements based on its intended use as well as the intended soldier-machine interface.

Performance requirements should address the soldier, the performance standard, and the conditions (operational environment).

Design elements are normally inappropriate unless modifications are required. An example of some of the MANPRINT influenced modifications is provided for information.

Page 2 of 2

NOTE: Highlighted issues will be carried through later examples to provide continuity of development.

FOR TRAINING PURPOSES ONLY

Example EX-8--MANPRINT in the
Functional Purchase Description

**MANPRINT
HANDBOOK FOR
NONDEVELOPMENTAL ITEM (NDI)
ACQUISITION**

(INTENTIONALLY LEFT BLANK)

CHAPTER 9 MANPRINT APPLICATIONS IN THE PRODUCTION AND DEPLOYMENT PHASE

9.1 Overview: MANPRINT in the Production and Deployment Phase

The Production and Deployment Phase of NDI is the MANPRINT execution phase; it is primarily the application of the work done in previous phases. In the Production and Deployment Phase, the program plans are executed and the NDI system is procured and fielded. MANPRINT focuses on three areas of involvement: the System MANPRINT Management Plan; the Source Selection Process which includes the Source Selection Plan, the Solicitation Document, and the Source Selection Evaluation; and, as appropriate, limited Test and Evaluation.

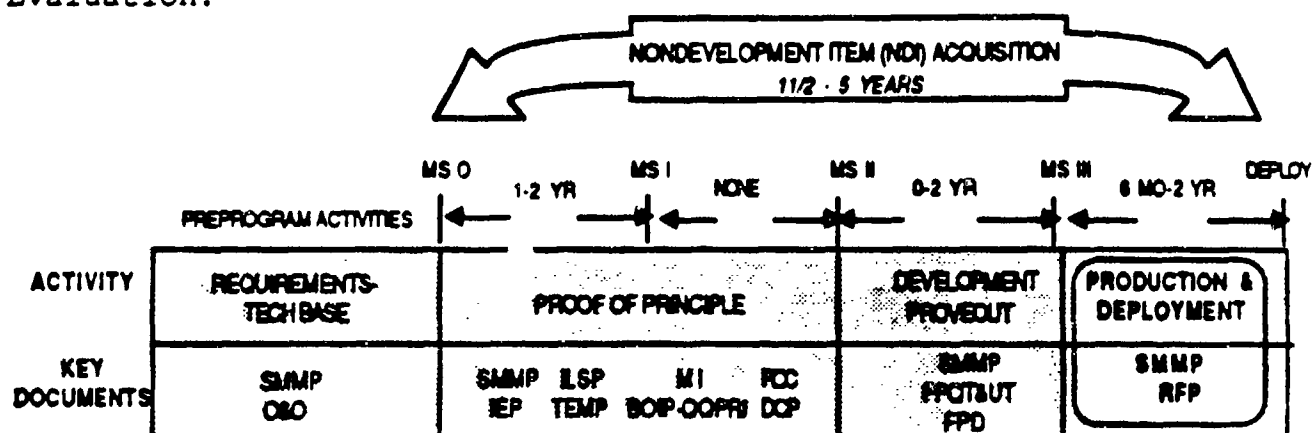


Figure 9-1--MANPRINT Related Documents in the Production and Deployment Phase

In the procurement of complex systems, the Functional Purchase Description (FPD) may not be totally adequate to describe the NDI system from the standpoint of soldier performance and reliability. There is also the possibility that an offeror's product which was not assessed during the MI could meet the FPD and still contain features which would adversely impact on MANPRINT requirements and constraints. For example, a product's design could impose an unacceptable manpower or job skills requirement on the Army, or contain safety and health hazards that would not be present in a competitive product. For this reason, consideration should be given to obtaining bidder's products for Army MANPRINT and other evaluations prior to contract award.

9.2 The System MANPRINT Management Plan (SMMP)

The purpose of the SMMP in the Production and Deployment Phase is to function as an audit trail which identifies all the tasks, analyses, tradeoffs, and decisions that affect the MANPRINT issues of a system. In this phase of NDI, the SMMP provides a central document that contains the necessary MANPRINT information to support

preparation of the solicitation document.

9.3 The Source Selection Plan (SSP)

a. The Source Selection Plan defines the Army's approach on how it will purchase what it wants. The SSP is the written guide for the source selection process, describing: how proposals will be solicited from industry; how they will be evaluated; and negotiation procedures.

b. In order for MANPRINT to impact the selection of the final product, it is important for MANPRINT to be factored into the SSP. The SSP has no set format, but typically consists of two parts--organization, membership, and responsibilities of the source selection team, and evaluation criteria and procedures for proposal evaluation.

c. References 9d and 9e detail the organization considerations and address MANPRINT integration in the planning of the procurement. MANPRINT is a separate area of evaluation (Reference 9g), although the manner in which it is considered and the relative importance placed on MANPRINT may vary. Two primary areas that must address MANPRINT are the evaluation criteria and the evaluation procedures.

1) The evaluation criteria are weighted factors that should reflect the value that the Army places on each element. The weighting of MANPRINT should reflect the degree to which soldier performance and supportability impacts on the system effectiveness and availability.

2) Two approaches are currently used to evaluate MANPRINT in the source selection--MANPRINT as a single element and MANPRINT as an integrated function. The method that is selected will be dependent upon the complexity of the system being evaluated.

9.4 The Solicitation Document

The primary task of the solicitation document--Invitation for Bids (IFB), Request for Quotation (RFQ), or Request for Proposals (RFP)--is to convey to industry what it is that the Army wants to procure in terms of system performance. The solicitation document can range from the Functional Purchase Description used with a Category A NDI, such as a flashlight, to a detailed RFP in more complex procurements, such as in the Mobile Subscriber Equipment (MSE) acquisition.

9.4.1 MANPRINT in the Solicitation Document.

The MANPRINT input to the solicitation document will depend on the type of the procurement selected--sealed bid or negotiation.

a. MANPRINT evaluation under sealed bidding (one-step) is restricted to bid samples which are examined for characteristics specified in the invitation for bids. Under sealed bidding, award is

predicated on price alone. If additional information addressing MANPRINT issues is required, then two-step sealed bidding or a Request for Proposal should be used. The use of bid samples in the one-step sealed bid should be considered in cases where most desired product characteristics can be adequately described in the specifications. The opportunity for MANPRINT evaluation is limited, and the procurement agency should consider the use of bid samples as the method of choice in determining if the proposed NDI will be operationally suitable in an Army environment. Bidders may be required to submit information as a part of the bid process to address specific MANPRINT issues and concerns not determined from the market investigation (MI). The IFB must be structured to:

- 1) State the evaluation methods and criteria to be used in assessing bid samples. The solicitation language should permit the disqualification of an offeror if the Army determines that the proposed NDI fails when soldier-in-the-loop performance is evaluated.

- 2) State the use to be made of the bidder's submission of MANPRINT information. If the Army's assessment is to be used to disqualify less than adequate bidders, the IFB must specify the conditions which must be met if an offeror is to qualify based on the adequacy of the response to the Army request.

b. In the two-step sealed bid, the approach is similar to that described above. In the two-step method, the first step is used to determine those offerors who are in a competitive range from a technical standpoint, and the solicitation should address the factors cited above. MANPRINT should become one of the important discriminators in selecting among the competing offerors. The two-step method is used primarily in procuring high cost, complex NDI systems. In these complex NDI's, the qualification testing is determined by a formal Test Integration Working Group (TIWG) and reflected in the TEMP. In many ways, the qualification testing and evaluation assume the proportion and intensity of a development Initial Operational Test and Evaluation (IOT&E) program. The evaluation of MANPRINT is built into the soldier performance assessment in the same manner as in a developmental effort. Consequently, MANPRINT requirements must be inserted in the RFP.

9.4.2 MANPRINT in Negotiated Procurements Request For Proposal (RFP).

NOTE: Reference 9f provides comprehensive "how to" instructions on MANPRINT in the RFP. In complex NDI procurements, there is essentially little difference in the methodology. This section will highlight the essential elements and provide the NDI perspective, as appropriate.

A typical RFP will have several sections which, together, define the total system requirement. For MANPRINT to be successful, the requirements of six domains (defined in Chapter 3) must be integrated throughout the RFP. Depending on the category of NDI as well as the complexity of the system, up to six areas can be identified where MANPRINT should be addressed:

a. The Executive Summary - provides a synopsis of the key elements of the procurement. The importance that the Army places on MANPRINT can be emphasized by describing the impact MANPRINT issues will have on the source selection. Normally an Executive Summary will only be used with more complex, major procurements.

b. The Statement of Work (SOW) - describes the management and technical effort to be provided under the contract and the work to be accomplished to assure that system performance meets specifications. Again, the SOW will normally be limited in scope. In an NDI acquisition, you should have already determined that the system is MANPRINT acceptable and the SOW will be limited to addressing modifications and ruggedization.

c. The System Specifications - describe the system performance and physical characteristics as well as any special testing or examinations required to verify that system characteristics are met. The system specifications are normally the Functional Purchase Description.

d. The Contract Data Requirements List (CDRL) - explains what information the contractor will be required to furnish, when, and in what format. MANPRINT data needs are tied to specific sections of the SOW or system specification. Standardized Data Item Descriptions (DID) provide format and content guidance and, in many cases, can be tailored. DID are cataloged in the Acquisition Management Systems and Data Requirements List (AMSDL). [See Appendix D for MANPRINT related DID.]

e. Instructions to Offerors, Section L - provides specific details on what must be addressed in the offerors' technical proposal to include planned activities such as testing, safety programs, and MANPRINT. Additionally, in an NDI solicitation, specific information may be requested from the offerors regarding their products' compliance with identified system specifications.

f. Basis for Award, Section M - explains to the offeror how his technical proposal will be evaluated. Both technical criteria and relative importance are provided.

9.4.3 MANPRINT in the SOW

The SOW defines the work to be performed by the contractor. No more or less work will be performed by the contractor than is stated in the SOW. In a Type A NDI procurement, the MANPRINT requirements reflect information gathered from the Market Investigation and the subsequent evaluation of MANPRINT conformity available in the marketplace. In Type B and NDI Integration, the SOW will identify any modification or development goals. The SOW should be tailored to complement statements contained in System Specifications. As currently recommended, MANPRINT domains appear in various areas of paragraph 3, Requirements. For cohesion, clarity, and understanding, MANPRINT should appear as a single subparagraph of paragraph 3.

9.4.4 MANPRINT in System Specifications

System specifications are generally not separately developed for NDI acquisitions, and the Functional Purchase Description is used to describe the item. System specifications, when used, provide specific ranges of desired performance, usually through identification of minimum and desired performance characteristics. Specifications are written to be satisfied by the NDIs evaluated during the MI but must not be written around a particular manufacturer's product. Under current guidance, MANPRINT inputs can be addressed in several subparagraphs (See following example):

a. Performance Characteristics - should establish the "man-in-the-loop" aspects of system performance goals. In this section, performance requirements should be addressed in terms of achieving identified soldier standards.

b. Physical Characteristics - should address any physical characteristics of the hardware that are of concern to the MANPRINT program. Physical capabilities of the target audience should be the basis for establishing any constraints.

c. Safety - should contain the safety and health hazard provisions required to minimize risks to personnel.

d. Human Engineering Program - should address specific MANPRINT concerns such as constraints on allocation of functions to personnel, personnel-equipment interface, or task criticality constraints limiting the serious effects of human error.

e. Manpower, Personnel, and Training - should include projected operator and maintainer limitations (numbers and types), soldier aptitude constraints, and maximum training burden constraints. The preference for embedded training shall be explicitly stated.

f. Special Tests and Examinations - should include any MANPRINT specific tests proposed for the system or required for acceptance.

4.2. Physical Characteristics

4.2.1 Noise. All versions of the CGSA will be modified, as required, so as to restrict noise levels to no more than 70 decibels when measured at 7 meters and no more than 85 decibels when measured at the operator station.

4.8 Special Tests and Examinations

4.8.1 Noise Level Test. Noise levels shall be measured in accordance with MIL-STD-1474 requirements and reported in the format indicated by MIL-STD-1474, Figure 7. As a minimum: noise levels shall be measured when equipment is operating under full load. MIL-STD-1474, paragraph 5.1.2.1.4 contours shall be taken at not fewer than 12 equal (horizontal) arc increments, one increment shall include data from the noisiest position. Additionally, the noise level at the typical operating position shall be provided as dB(A) level. Failure to comply with MIL-STD-1474 provisions shall constitute failure of this test.

identify those requirements which are not satisfied and provide justification for the difference.

e. Description of data, documentation, manuals, and training materials to be furnished.

f. Identification of types of skills and quantities of personnel required to operate, maintain, and repair the item.

g. Certification that the item meets Army health and safety requirements stated in the solicitation document.

9.5 MANPRINT in Source Selection Evaluation

NOTE: References 9d and 9e fully address the source selection evaluation process. Evaluating MANPRINT in an NDI acquisition is accomplished in a similar fashion. This section will highlight the essential elements and provide the NDI perspective, as appropriate.

MANPRINT in NDI is an evaluation process. The role of MANPRINT in evaluating offerors' proposals must reflect the importance of MANPRINT to the Army and be clearly defined in the proposal.

9.5.1 The Use of Bid Samples.

A physical demonstration of the system's characteristics, using offerors' hardware and the specifications set forth in the solicitation document, may be required. (Note: The use of bid samples should be considered primarily in cases where most desired product characteristics can be adequately described in the specifications.) In order to capitalize on the advantages of NDI, it is often necessary to accept an NDI product "warts and all". It is the purpose of the bid sample to uncover gross MANPRINT deficiencies that could lead to a bidder's disqualification and to reveal problems which may not be of sufficient magnitude to disqualify a bidder but which must be dealt with by the Army. For example, a non-critical safety hazard may be found which would not disqualify the bidder; the Army cannot ignore the hazard and would need to address the deficiency to eliminate or reduce the risk. In some instances, a caution or warning label, or modification of training would resolve the problem.

9.5.2 Assessing the Best Value.

The Source Selection Authority should be provided with the flexibility to make awards based on "best value" to the Government. Because actual source selection must be based on the factors and their relative importance as stated in the RFP (Basis for Award, Section M), more front-end time, including war-gaming should be spent determining and weighting the critical evaluation criteria (i.e., MANPRINT) that will form the basis for award. When technical superiority is the overriding factor, cost should have less importance than technical factors to ensure the Source Selection Authority has the necessary flexibility. Early involvement of the

contracting officer and legal counsel is advised. As a major source selection criterion, MANPRINT must be highly visible and consideration should be given to integrating it across the other major evaluation areas. No other element, factor, or subfactor within the same area should be weighted more than MANPRINT.

Figure 9-2 provides a simple example of how properly weighted MANPRINT considerations can impact on the "best value" approach to selection of alternative systems.

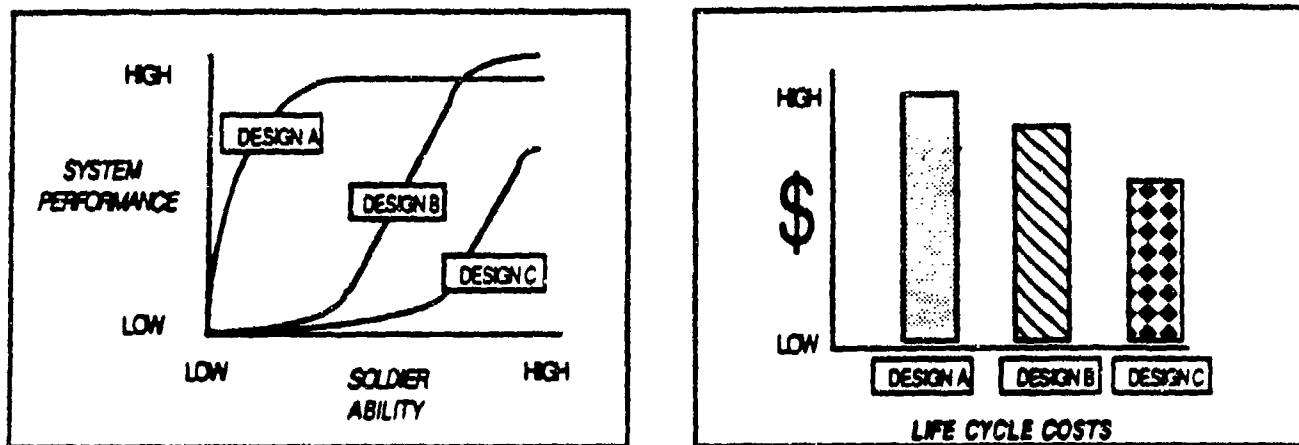


Figure 9-2--Selection of Alternatives

In this example, System A provides high performance when used by soldiers with relatively low ability but at a higher cost. System C can be procured at a relatively low life cycle cost but requires soldiers with high ability to achieve high system performance. To resolve the "best value" question requires consideration of:

a. What is the system performance requirement? The primary MANPRINT goal is to optimize system performance. As shown in Figure 9-3, if the required system (soldier-machine) performance level is

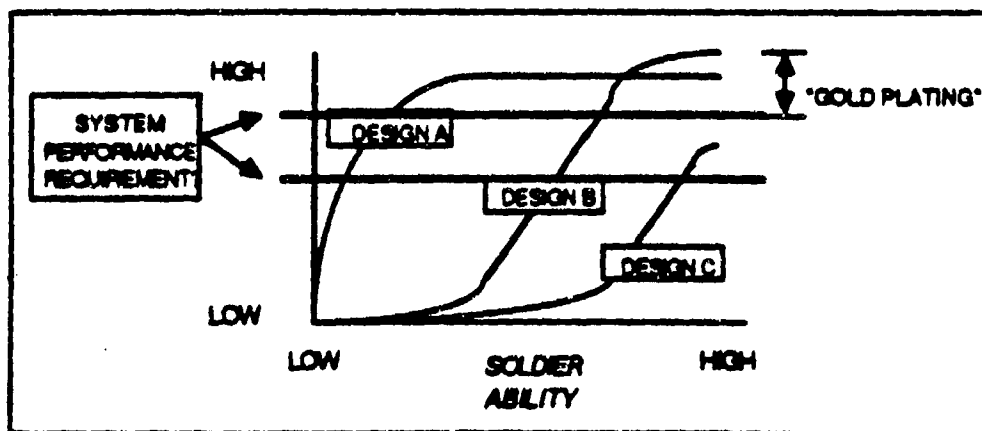


Figure 9-3--Selection of Alternatives (Performance)

mid-point on the system performance axis, then all three systems can achieve the performance criteria and are considered acceptable. The best value approach attempts to avoid "gold plating" - the practice of developing or purchasing systems with capabilities exceeding identified user needs.

b. What are the abilities of the Target Audience? Early on in the MANPRINT process, the target audience is identified and described in terms of aptitudes (minimum aptitude scores from ASVAB Testing), skills (from type training), and ability. As shown in Figure 9-4, consideration of those abilities should be incorporated in demonstrations by including a cross section of the target MOS.

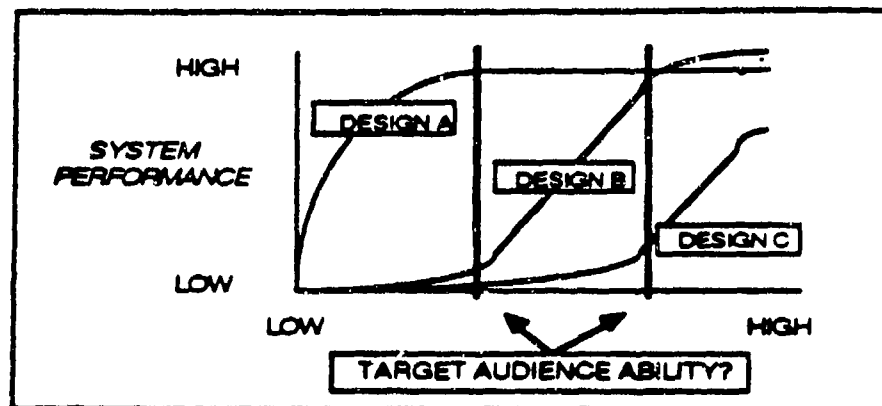


Figure 9-4--Selection of Alternatives (Ability)

9.6 Follow-On Test and Evaluation

a. An important advantage of NDI is reduced acquisition time. This is accomplished, in part, by minimizing Army testing on NDI. General guidance is that the Army will not test when existing data - from industry or other sources - provides the Army with reasonable answers.

b. An updated TEMP is required for the Production and Deployment Phase. The TIWG-TEMP process ensures that testing requirements will be tailored to each specific system and will be described and justified in the TEMP and specifically approved by the program decision authority.

9.7 Chapter References

**FOR ADDITIONAL INFORMATION ON
CHAPTER 9, REFER TO:**

- 9a. AMC-TRADOC PAM 70-2, Materiel Acquisition Handbook
- 9b. MIL-HDBK-245, Preparation of Statement of Work (SOW)
- 9c. MIL-STD 490, Specification Practices
- 9d. AMC PAM 715-3, The Source Selection Process
- 9e. "MANPRINT in the Source Selection Process", Draft - December 1988
- 9f. AMC Pam 602-1, MANPRINT Handbook for RFP Development
- 9g. "MANPRINT in the Evaluation Process", ASARDA Letter dated 28 August 1988.
- 9h. AR 70-10, Test and Evaluation
- 9i. DA Pam 70-21, A Test and Evaluation Guide

CHAPTER 10 MANPRINT AND TRAINING DEVICES

10.1 Training Devices (TD) - General

a. There has been an enormous growth in the need for and use of training devices and simulators to reduce the high costs associated with the actual use of weapon systems and equipment for training purposes. Training devices, such as items that incorporate hardware and software, may be more complex than the systems they replicate. For example, a maintenance trainer must realistically simulate multiple failure modes of the actual equipment without damage to the device. This may require increased complexity in the electronics and wiring, use of microchip technology not present in the replicated system, and incorporation of unique components so that parts can be electronically "failed" without actual damage. The complexity, the potential for increased soldier-system interface, and, in system specific devices, the primary system dependency on the TD to develop and maintain requisite skills, requires MANPRINT to be an integral part of the TD acquisitions.

b. This chapter provides an overview of TD acquisitions with emphasis on NDI training devices. To enhance understanding, a brief review of TD in general and discussion on MANPRINT in development training devices is also presented.

10.1.1 Categories of Training Devices.

Training devices are classified in two broad categories:

a. System specific - designed, developed, or procured to support a specific system, such as the TOW missile trainer.

b. Non-system specific - designed, developed or procured to support general training, such as the MILES system which supports training with multiple systems and soldiers.

10.1.2 Training Device Requirements.

The acquisition of training devices parallels the materiel acquisition process in general. The requirement for training devices, however, can be presented in any one of three forms:

a. Training Device Requirement (TDR). The TDR is a formal requirement for the development of a non-system specific training device. Chapter 5, AMC-TPADOC Pam 70-2, provides a description of both the process and format for a TDR.

b. Training Device Appendix to a ROC. The training device appendix to the ROC is used for a system specific training device. It provides for concurrent development of the training device with the system. The format and process are the same as for the TDR.

c. Commercial Training Device Requirement (CTDR). The CTDR is an NDI approach to training device acquisitions and is discussed separately later in this chapter.

10.1.3 MANPRINT in Training Device Acquisitions.

The perspective of MANPRINT in TD acquisitions differs from that of the system being supported. The abilities of the operator, maintainer, and support personnel are still central to the objectives. However, the focus is on the people--military, civilian, and contractor--as they relate to the training device. The trainee (military) is the recipient or beneficiary of the training. The operator is the person (military, civilian, or contractor) who operates the training device, such as an Instructor-Operator or Exercise Initiator. Much of the effectiveness of a training device--training transfer, critique capabilities--depend upon the external operator and, therefore, his/her position should be scrutinized for MANPRINT impacts. The maintainer is the person who troubleshoots and repairs the training device. The support personnel are those who support the training device. Training device effectiveness and cost effectiveness are key aspects of training device acquisitions and are addressed at the training device level as well as the primary system level.

a. Development Training Devices. In system and non-system specific training device development, MANPRINT impacts the design decisions the same as in the traditional acquisition process. The MANPRINT issues and concerns are developed as the TD develops. The TDR format parallels the ROC format and the MANPRINT involvement in defining essential man-in-the-loop characteristics as well as the MANPRINT assessment of domain-related areas does not differ.

b. NDI Training Devices. Commercial training devices (CTD) are a unique category of materiel that is often overlooked when discussing the material acquisition process in general and NDI in particular. CTDs, while typically NDI in nature, are not procured through the NDI acquisition process. The remainder of this chapter will outline an approach to integrate MANPRINT in commercially available training device procurements, i.e., those utilizing a CTDR.

10.2 Commercial Training Devices (CTD)

10.2.1 What is a Commercial Training Device?

Commercial training devices include both system and non-system specific items acquired to support military training. CTDs are commercially available with no R&D effort required to alter the device to meet the training need.

10.2.2 Commercial Training Device Categories.

CTDs are categorized by cost and initiating agency. The CTD category impacts on the processing, who has approval authority, and who the procurement agency for the acquisition will be.

a. Cost. CTDs are divided into two funding categories: Expense items - those which cost less than \$5,000 per unit; and, Investment items - those which cost more than \$5,000 per unit.

b. Initiating Agency. CTDs are further categorized into two initiation categories: Army-wide CTD; and, MACOM peculiar CTD. An Army-wide CTDR is initiated by the proponent training developer to address specific training needs. A MACOM initiates and prepares the CTDR when they identify a training deficiency or need peculiar to the command that can be satisfied by a commercially available device.

10.2.3 Commercial Training Device Acquisitions.

a. CTD Acquisition Process.

1) Chapter 5, AMC-TRADOC Pam 70-2, provides a description of the processing and format for both an Army-wide and MACOM peculiar Commercial Training Device Requirement (CTDR). It is important to note that the CTDR is the program initiation document, the staffing and coordination document, the requirement document and the program approval document.

2) Unlike an NDI acquisition, there is no formal requirement for an IEP, MI, generic requirement document, or open competition. A CTDR may be written based on a specific item from a specific source. CTDRs are NDI acquisitions and are not exempt from the requirement for a SMMP.

b. Procurement Approval. CTD procurements can be approved at varying levels, depending on the cost and initiating agency.

1) MACOM peculiar CTDR. If the total procurement is less than \$5 million, the MACOM has approval authority with TRADOC and AMC concurrence. From \$5 to \$500 million, AMC and TRADOC are the joint approving authority. Above \$500 million requires HQDA approval.

2) Army-wide CTDR. If the total procurement is less than \$15 million, TRADOC is the approving authority. From \$15 to \$500 million, AMC and TRADOC are the joint approving authority. Above \$500 million requires HQDA approval.

10.3 MANPRINT Applications in CTD Acquisitions

Due to the high dollar amounts involved in CTD procurements and the unique procurement process, it is important to look at the area of commercial training devices and MANPRINT, and develop a strategy that addresses human performance as an integral part of the acquisition process.

10.3.1 MANPRINT Responsibility.

Minimum guidance currently exists on how to address MANPRINT considerations in CTD procurements. It is incumbent upon the training community as a whole and training developers individually to accept

responsibility as MANPRINT advocates and managers.

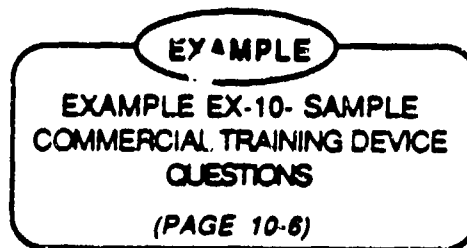
10.3.2 Integrating MANPRINT in NDI Training Device Acquisition.

a. Training involves the interaction of the trainer, available training resources (time, dollars, facilities, and TD), and the soldier. MANPRINT is concerned with optimizing this total system performance.

(1) The need for a training device is determined based on detailed front-end analyses under a process titled Systems Approach to Training (SAT). By using SAT, training requirements will be identified. (See Reference 10e.)

(2) All proposals for training devices should be submitted with detailed descriptions of the training deficiency.

b. When considering the acquisition of a training device, the issues and supporting questions (Appendices A and B) previously developed can be utilized in evaluating the proposed CTD. MANPRINT concerns and constraints must be resolved or satisfied by the CTD acquisition. MANPRINT Questions for Market Investigation, Appendix B, should be utilized to determine if a commercially available training device will satisfy the training deficiency and fit within MANPRINT constraints. The approach to identifying the human performance issues associated with operating, maintaining, and supporting the commercial training device should parallel, although less formally, the procedures used in an NDI acquisition. An example of some selected questions to be addressed is shown in Example EX-10.



c. When dealing with a CTD, integrating MANPRINT is accomplished by addressing MANPRINT issues in the Commercial Training Device Requirement (CTDR). The CTDR is the sole document that is used in identifying the need, coordinating the requirement, and receiving approval for the acquisition. Specific areas where MANPRINT can be addressed include:

(1) Paragraph 5 - Characteristics. Highlight soldier performance requirements (such as complexity of trainer operation, compatibility of maintainer training requirements, safety features, etc.) as an integral part of essential performance characteristics description.

(2) Paragraph 11 - Impacts. Subparagraph b addresses manpower and personnel. Include safety, health hazard, and HFE implications if issues exist. Provide comments on how the deficiencies will be dealt with or worked around. A sample of how MANPRINT can be addressed is provide in Example EX-11.

EXAMPLE**EXAMPLE EX-11- SAMPLE
MANPRINT IN A CTDR***(PAGES 10-7 to 10-8)***10.4 Chapter References****FOR ADDITIONAL INFORMATION ON
CHAPTER 10, REFER TO:**

- 10a. AR 602-2, Manpower and Personnel
Integration (MANPRINT) in the Materiel
Acquisition Process
- 10b. AMC-TRADOC PAM 70-2, Materiel Acquisition
Handbook
- 10c. "The MANPRINT Primer", April 1987
- 10d. AR 350-38, Training Device Policies and
Procedures

EXAMPLE

The following are selected examples of the type of questions, and their related performance issues, which should be asked in conjunction with seeking a commercial training device (CTD).

SELECTED QUESTIONS

MANPOWER

How many people will be required to operate, maintain, and support the device? Who will operate, maintain, and support the device? Is there a predecessor system? If so, can the manpower be transferred? If the device generates a new manpower requirement, can the Army support it? If not, who pays the manpower bill?

PERSONNEL

What aptitudes are required to operate, maintain, and support the device? Are aptitudes compatible with existing aptitude requirements in operator and maintainer MOS? Will additional personnel be required to be recruited? Will new MOS or ASI be required?

TRAINING

How will individuals or crews be trained to operate and maintain the device? Is training compatible with with operator and maintainer experience? Will contractor training be provided? ...beyond new equipment training? Will the device be utilized in sufficient density to require the establishment of an Army training program?

HEALTH HAZARDS

Does the device involve: laser? noise? vibration? fumes? What repair materials are required? What precautions must operators and maintainers take? Are there environmental limitations to using the device?

SAFETY

Have considerations of back blast or misfires of training rounds been addressed? Is the device free of shock hazards? What safety features are included? Has safety been addressed in training?

HUMAN FACTORS

Can instructors operate instructor stations? Are components accessible for ease of maintenance? Are safety devices (over-ride switches, emergency off, etc.) immediately accessible?

IMPACTS

Ability of the operator and maintainer to perform all required functions within the time limits (Perform to standard)

Aptitudes of the operators and maintainers required to perform necessary functions and ability of Army to support the personnel requirements of the new system.

Ability to train TD operators and maintainers. Resources required to support the new system. Impacts on skill development (aptitude + training).

Ability to perform within the training environment and to sustain operator and maintainer performance (normally considered for long term impact).

Ability to perform all tasks and to sustain operator and maintainer performance (normally considered for short term impact). Impacts on reliability (system failure due to errors).

Ability to perform within the system constraints. Impacts on ability to perform to standards.

NOTE: Highlighted issues will be carried through later examples to provide continuity of development.

FOR TRAINING PURPOSES ONLY

Example EX-10 - Sample Commercial Training
Device Questions

EXAMPLE

**COMMERCIAL TRAINING DEVICE REQUIREMENT (CTDR)
FOR
REFRIGERATION AND AIR CONDITIONING TRAINING DEVICE**

1. Title
 - a. Refrigeration and Air Conditioning Training Device,
 - b. CARDS # 1234
2. Category: Army-wide; more than \$5,000.
3. Currently on hand: None
4. Justification: (Justification of why the item is needed and what training or functional improvement is expected.) This equipment will support skills and knowledge training in the ISD identified tasks and soldier's manual tasks listed in Annex B. A Training Device Study (TDS) is at Annex A.
5. Characteristics: (Omitted - Available specifications, and literature.)

The system must be operable by soldiers holding MOS 52D in grades E-3 to E-5. Initial operator training shall not exceed more than two weeks (80 hours) of contractor training. Technical and operational manuals shall be of sufficient detail to allow training of operator and maintainer personnel in all essential tasks necessary for the operation and scheduled maintenance functions of the training device.
6. Distribution: U.S. Army Transportation School, Department of Marine and Terminal Operations, Fort Eustis, VA 23604
7. Source: Hampden Engineering Corporation, East Longmeadow, MA 01028
8. Cost:
 - a. Cost per item: \$276, 250.
 - b. Total Number of items to be Procured: 1
 - c. Total Procurement Cost: \$276, 250.
9. Date Required: 1 October 1988 (Omitted: Impact if not received when requested.)
10. Support Organization:
 - a. Unit Maintenance - USATSCH, Training and Audiovisual Support Center
 - b. Intermediate Maintenance - USATCFE, Directorate of Industrial Operations, Maintenance Department

PAGE 1 OF 2

NOTE: Highlighted issues will be carried through later examples to provide continuity of development.

FOR TRAINING PURPOSES ONLY

*Example EX-11 - MANPRINT in a Commercial
Training Device Requirement (CTDR)*

EXAMPLE

11. Impacts: (List any MANPRINT shortfalls [tradeoffs] and how they will be accommodated.

a. No construction will be required.

b. **MANPOWER:** No additional authorizations needed for support.

PERSONNEL: Requires two dedicated instructors. One available. Two assistant instructors will be trained and alternated to meet requirements and maintain proficiency.

c. Will not replace or support any other device.

d. No special transportation requirements.

12. Spare Parts (See attached list - Omitted)

FY88	FY89	FY90	FY 91	FY92
\$500	\$1000	\$1500	\$1500	\$1500

13. Special Tools: (See attached list - Omitted)

FY88	FY89	FY90	FY 91	FY92
\$9460	-----None Required-----			

14. Funding Summary:

	FY88	FY89	FY90	FY 91	FY92
Investment	1/\$278,450	--	--	--	--
O&S	\$ 9,960	1000	1500	1500	1500
MILCON	-----None Required-----				

ANNEX A - Distribution Plan

PAGE 2 OF 2

NOTE: Highlighted issues will be carried through later examples to provide continuity of development.

FOR TRAINING PURPOSES ONLY


Example EX-11 - MANPRINT in a Commercial
Training Device Requirement (CTDR)

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APPENDIX A

QUESTIONS SUPPORTING MANPRINT CONCERNS

APPENDIX A
QUESTIONS SUPPORTING MANPRINT CONCERNS

ISSUE: EFFECTIVENESS (MATRIX POSITION 1)

SOLDIER-MACHINE INTERFACE: The probability the soldier will be able to perform all tasks to standard in the operational environment.

MANPOWER:

What tasks (by position) are required to be performed to make the system operate at prescribed performance levels?

How many operators are required?

How is workload distributed?

Have "off-equipment" tasks been considered?

Can impacts on system performance at various manning levels be predicted?

What is the minimum crew required?

How will degraded manning affect performance?

PERSONNEL:

Can the Army's target audience operator perform all tasks to standard?

Who was the system designed for?

How does the Army operator compare?

Which tasks are the most difficult?

Which personnel characteristics are critical?

Will MOS standards have to change?

Is a new MOS needed?

TRAINING:

Are new or difficult tasks required?

What type of training is needed? Are doctrinal changes needed? How long must training be?

Will all critical tasks be taught?

How will the target audience do in training?

What is the projected attrition rate?

Will performance standards be met?

How does this compare with existing training?

What training strategy must be employed?

How much sustainment training is needed?

Does the unit have time available?

QUESTIONS SUPPORTING MANPRINT CONCERNS

Is a training device available?
 Will the training device be needed in the unit? In the institution? Is embedded training possible? desirable?

HUMAN FACTORS:

Were soldier-machine analyses used during system development?

Task analysis?
 Functional analysis?
 Workload analysis?
 Was performance tested under actual conditions?

Will the system design enhance performance?

What design standards were used?
 How do they compare to Army standards?
 Was the operational environment considered?
 Do controls and display layout optimize use?

HEALTH AND SAFETY:

Have all potential safety and health hazards associated with the system been identified, evaluated, and eliminated?

Has the contractor utilized any system safety program during design and fabrication of the system?

Were any hazard analyses conducted?

Are there lessons learned or historical accident data applicable to this system?

What were the safety design requirements used?

What safety testing has been conducted? To what standards and by whom?

Are there any unique safety features, restrictions and special procedures applicable to this system?

Are there any known safety and health hazards that have not been eliminated or controlled?

What is the safety supporting documentation available for milestone decision reviews?

Do technical publications contain warnings, cautions and proper procedures for safe use of the system?

Are there any specific safety issues applicable to type of system being evaluated (i.e. DOD Hazard Classification)?

QUESTIONS SUPPORTING MANPRINT CONCERNS

ISSUE: EFFECTIVENESS (MATRIX POSITION 2)

UNIT EFFECTIVENESS: The probability that the unit will be able to perform all tasks and missions to standard in the operating environment.

MANPOWER:

How many systems are to be fielded?
Can the proposed system integrate with existing systems?
Is it dependent on other systems?
Will additional unit tasks be required?
Can all the systems be sustained in unit operations?

PERSONNEL:

Can unit personnel perform tasks to standards?

What interface tasks exist?
Are they complex?
Can supervisors perform additional tasks?

Will the unit be receptive to the equipment (user acceptance)?

TRAINING:

Can the unit sustainment training be accomplished?

How much time must be used?
Will supervisors be trained?
Is a unit training device required?
Is embedded training appropriate?

What range of threat is envisioned for system employment?
Will doctrine or tactical training be required?
Will all envisioned threats be trained?

HUMAN FACTORS:

What are the mean times to deploy and recover (setup for operation and shutdown after operation)?

What are the impacts on mission relevant tasks of mission induced human stress?

QUESTIONS SUPPORTING MANPRINT CONCERNS**ISSUE: EFFECTIVENESS (MATRIX POSITION 3)**

TOTAL SYSTEM PERFORMANCE: The probability that all of the different elements will interface correctly to achieve total system performance.

MANPOWER:

What impact will introduction of the system have on the organization's combat effectiveness?

What organizational changes will be required?
Will the overall operational and support concept be supportable?
Are total manpower requirements within Army constraints?
Are sufficient authorizations available to man the system?

PERSONNEL:

Can the personnel system support the system?

Are personnel distribution problems created?
Do grade structures support promotion standards?
Are problem MOS used?
Will increased overhead (TTHS) be created?
Will new MOS be created?

TRAINING:

Can the training strategy be supported?

Is institutional training within constraints?
How many additional instructors are required?
How will supervisors be trained?
What resources will be needed to support the training devices?
Will training manuals be available?

OTHER:

What will be the impact on the U.S. Army Reserve and National Guard?

Will the predecessor system be transferred?
Will the new system be fielded within the U.S. Army Reserve or Guard?
If not, are the predecessor and new system compatible?

QUESTIONS SUPPORTING MANPRINT CONCERNS

ISSUE: SUPPORTABILITY (MATRIX POSITION 4)

SOLDIER-MACHINE INTERFACE: The probability that soldiers (or intended maintainers) will be able to perform all installation or maintenance tasks to standards under operational conditions.

MANPOWER:

What preventive maintenance tasks are required?

At what intervals?

How long do the tasks take to accomplish?

Are any tools, new tools or special tools required?

What materials are required?

Is a checklist available?

What operator repairs can be made?

What diagnostics are available to differentiate?

What materials are required?

Do operator repairs require additional personnel due to parts placement, task difficulty, etc.?

PERSONNEL:

Can operator maintenance be accomplished by the target audience?

Was the system designed for maintenance ease?

How complex are the repair tasks?

What other off-equipment tasks is the maintainer responsible for?

TRAINING:

What training is required to enable repair performance?

How complex are repair tasks?

How frequently will the skills be called upon?

Which required skills are compatible with current requirements?

What new skills will be required?

What hazards are associated with the equipment repair that will require training?

SYSTEM SAFETY:

What hazards are associated with the equipment?

What cautions must be taken to avoid injury or damage to the equipment?

QUESTIONS SUPPORTING MANPRINT CONCERNS

Is any protective or safety equipment required? If so, is it available?

HEALTH HAZARDS:

Does the equipment contain any hazardous material?

What precautions have been taken to limit or eliminate exposure?

What protective equipment is required in handling?

Can the material interact with other agents to form hazardous or toxic substances?

Do repairs require the use of toxic or hazardous substances?

What precautions are required for use?

What special handling is required?

Can unintentional or accidental actions or activities by maintainers or operators expose unsafe or hazardous conditions?

HUMAN FACTORS:

Can soldiers who are dressed appropriate to the environments of interest operate and maintain the item?

Are tools provided with the item or in the TO&E adequate to conduct Level 1 maintenance of the item?

Is the item designed such that operation and maintenance can be accomplished in a manner which requires a straight forward operator-maintainer training and limited recall of trained details?

Can typical maintenance tasks (air filter replacement, cleaning, oil filling, etc.) be conducted without the need for special tools? Is access for all maintenance actions adequate?

QUESTIONS SUPPORTING MANPRINT CONCERNS

ISSUE: SUPPORTABILITY (MATRIX POSITION 5)

UNIT EFFECTIVENESS: The probability that support units will be able to perform required support to standard within the projected operational environment.

MANPOWER:

What maintenance tasks will be required at the support unit level?

How many echelons of maintenance?

What tasks are required at the intermediate level?

Can existing mechanics be used?

What special tools are required?

PERSONNEL:

Can intermediate maintenance tasks be accomplished by the target audience?

What aptitudes are required?

What is the repair task difficulty?

Are new types of tasks created?

Will the right people be available in support units?

Are new MOS required?

What grade levels are required?

TRAINING:

What training is required for support personnel?

How frequently will tasks be done?

Do requisite skills already exist?

Will sufficient systems be fielded to justify special training?

Will special diagnostics be used?

How much training is required (time, cost)?

HUMAN FACTORS:

Is the item designed such that a full range of soldiers can transport, handle, drive, etc., the item without becoming excessively fatigued?

Does the item provide adequate feedback to the maintainer of maintainer actions?

Is labeling of the item adequate to guide maintainer actions and to cause maintainers to avoid uncontrollable hazards?

QUESTIONS SUPPORTING MANPRINT CONCERNS**ISSUE: AVAILABILITY (MATRIX POSITION 6)**

SOLDIER-MACHINE INTERFACE: The probability that the system will meet performance criteria as often as required.

MANPOWER:

Can task performance be sustained?

How long?

How often?

Are redundant crews required?

Can operators repair the system? What level of on-site maintenance is required?

What is the effort of continuous operations?

What are casualty projections?

PERSONNEL:

Can the soldier perform the tasks required to sustain operations?

Are they complex?

Do they put the soldier at risk?

Do they maintain soldier motivation?

Is the Test, Measurement, or Diagnostic (TMDE) Equipment easy to use?

TRAINING:

How much sustainment training is required?

Can the unit sustain soldier skills?

How often must they be trained?

Is embedded training incorporated?

Is crew cross-training facilitated?

SAFETY:

What hazards are associated with continued operation of the system?

Is the soldier at risk during the use of the system?

Can safe emergency procedures be taught?

Is protective equipment required during operation or repair?

HEALTH HAZARDS:

Does operating or repairing the equipment expose the soldier to

QUESTIONS SUPPORTING MANPRINT CONCERNS

health hazards?

Will continuous operations increase the hazard?

Will soldier fatigue or stress caused errors increase the hazard?

Can precautions be realistically used on the battlefield?

HUMAN FACTORS:

Are the tasks facilitated by equipment design?

Does workload consider continuous operation?

Are reload-refuel-repair tasks complex or dangerous?

Can the soldier sustain the physical or mental task performance?

Will information flow hamper continued operations?

Is the equipment reliable?

Can the soldier depend on the system?

How difficult is it to fix?

Is it too cumbersome?

Is the system dependent on other systems for continued operation?

Is this interface sustainable?

Can autonomous operations be initiated?

Can autonomous operations be sustained?

APPENDIX B

**MANPRINT QUESTIONS FOR
MARKET INVESTIGATION**

APPENDIX B **MANPRINT QUESTIONS FOR MARKET INVESTIGATION**

(NOTE: Questions 1-14 and 16-22 should be addressed during a Market Investigation for Training Devices)

1. How many people are required to:
 - a. Operate the equipment (Make it work)?
 - b. Maintain the equipment?
2. What are the critical tasks for each person or position? What are the typical achievements (time and accuracy) for each critical task?
3. For what type of operator and maintainer was the system designed? Describe in the following terms (high to low ranges rather than average figures):
 - a. Experience level
 - b. Physical characteristics
 - sex
 - hearing
 - sight
 - strength capacity (upper/lower extremities)
 - anthropometric dimensions
 - c. Psychomotor ability
 - d. Aptitude (mental ability)
 - e. Education
 - f. Special training
4. What training courses are provided for operators and maintainers? What training does a typical operator and maintainer receive?
 - a. Describe the content of the course.
 - b. What are the performance objectives of the course?
5. What performance data (in time and accuracy) for the critical tasks, as a function of type of personnel and training, was achieved?
 - a. What level of equipment capability could be achieved when used by the defined operator and maintainer?
 - b. What operator and maintainer characteristics were determined critical or limiting factors in successful task performance (mental capability, lifting capability, memorization, eyesight, mechanical ability, etc.)?

MANPRINT QUESTIONS FOR MARKET INVESTIGATION

- c. Which tasks are the most difficult to be performed reliably?
 - d. Was there any evidence of mental or physical overload on the operator and maintainer?
 - e. Were operational sequences, communications flow, access to controls satisfactory for effective system operation?
- 6. Under what operating conditions was this performance data obtained?
 - a. Physical location (shop, field, classroom)?
 - b. Environment?
 - c. Individual clothing and equipment worn by the performing personnel?
- 7. What are the operator and maintainer position requirements of the system?
 - a. Define the major roles and tasks for each operator and maintainer.
 - b. Can the operator and maintainer positions be defined in military terms (e.g. Military Occupational Speciality, rank)? If not, what are the normal civilian classification descriptions of the operator and maintainer?
 - c. Have studies or demonstrations been conducted to determine the impact of degraded manning on system performance? What data relating degree of system performance to level of manning is available? Is there a minimum manning level required to achieve minimal system performance?
- 8. What equipment usage rate and operational setting was used to determine the operator and maintainer position requirements?
 - a. What equipment reliability, availability and maintainability data exists (e.g. warranty history)?
 - b. What are the impacts of using the equipment outside its design envelope in terms of equipment failure, increased operator and maintainer workload, or increased potential for injury to operator and maintainers?

MANPRINT QUESTIONS FOR MARKET INVESTIGATION

- c. Were any tasks, besides specifically operating or maintaining the system, included in the position requirement estimates?
 - d. Are there special or unique logistical support requirements for the system?
 - e. Are any system peculiar or specialized tools required to operate and maintain the system? If yes, describe.
 - f. Is the system dependent on external systems for normal operation? If yes, describe.
9. Were design modifications made from earlier generation models to improve operator and maintainer performance? If yes, describe.
10. What operator and maintainer human factors issues have been identified as potential influences on system performance (good and bad)?
11. What actions were taken to ensure that controls and displays are optimized for the operations?
- a. What criteria was used to design controls and displays and their locations?
 - b. Are warnings or emergency signals and alarms adequate to alert operator and maintainers in the event of a problem?
12. What anthropometric standards were used as system design criteria?
13. Has an operator or maintainer training program been established?
- a. How much time does it take to complete the training program?
 - b. What resources are required to employ this training (material, equipment, facilities, etc.)?
 - c. What ratio of students to instructors is the program designed for?
 - d. What type and amount of instructor training is required to implement the training program?
 - e. Do you provide any type of instructor, operator, or maintainer training?

MANPRINT QUESTIONS FOR MARKET INVESTIGATION

- f. Was testing done to determine the degree of system performance achieved by operators and maintainers after the training?
 - g. How many hours of training per month are required to sustain criterion performance?
- 14. What operational and training manuals are available for the system?
 - a. At what reading grade level are these written?
 - b. Does their use facilitate operation or maintenance of the system?
- 15. Is any type of training device used with the system?
 - a. How is this training device employed? Is it used in initial instruction or for refresher training?
 - b. Does use of this device produce cost savings?
 - c. Are special material or facilities required to use this device? How many instructors are required to employ this device during training?
- 16. What hazard analyses have been conducted?
 - a. What safety data has been collected and analyzed?
 - b. What health hazard data has been collected and analyzed?
- 17. What is the historical accident rate?
 - a. What types or categories of accidents are reported? Are any categories excluded from reporting?
 - b. Has an analysis been made which identifies accident causes? Have any product improvements been identified as a result of the analyses?
- 18. What were the safety design requirements used?
 - a. What codes or industry standards were applied?
 - b. What safety features are included in the product?
- 19. What safety or health testing has been conducted?
 - a. To what standards was testing conducted?
 - b. Who conducted the testing?

MANPRINT QUESTIONS FOR MARKET INVESTIGATION

- c. Who evaluated test results? What were the results?
- d. What is the noise level of this system when it is fully operational (under load)?
- 20. Are there any unique safety or health features? If yes, describe.
- 21. Are there any restrictions on usage? If yes, describe.
- 22. Are there any known safety or health hazards that have been identified with the product? If yes, describe. What controls are incorporated to minimize risks?

APPENDIX C

ACRONYMS AND ABBREVIATIONS

APPENDIX C **ACRONYMS AND ABBREVIATIONS**

-A-

AFQT	Armed Forces Qualification Test
AMC	U.S. Army Materiel Command
AMEDD	Army Medical Department
AMSAA	U.S. Army Materiel Systems Analysis Agency (AMC)
AMSDL	Acquisition Management Systems and Data Requirements Control List
AOE	Army of Excellence
AOSP	Army Occupational Survey Program
AP	Acquisition Plan
AR	Army Regulation
ARI	U.S. Army Research Institute
ARNG	Army National Guard
ARTEP	Army Training Evaluation Program
ARPRINT	Army Program for Individual Training
AS	Acquisition Strategy
ASAP	Army Streamlined Acquisition Process
ASARC	Army Systems Acquisition Review Council
ASI	Additional Skill Identifier
ASIOE	Associated Support Item of Equipment
ASVAB	Armed Services Vocational Aptitude Battery
ATM	Army Training Manual
ATSC	Army Training Support Center

-B-

BCE	Baseline Cost Estimate
BDP	Battlefield Development Plan
BIT	Built-in-Test
BITE	Built-in-Test Equipment
BOIP	Basis of Issue Plan
BOIPFD	Basis of Issue Plan Feeder Data
BTA	Best Technical Approach

-C-

CBTDEV	Combat Developer
CBRS	Concept Based Requirement System
CDR	Critical Design Review
CDRL	Contract Data Requirements List (DD Form 1423)
CFP	Concept Formulation Package
CG	Commanding General
CGSA	Commercial Generator Sets and Assemblages
COEA	Cost and Operational Effectiveness Analysis
CTA	Common Table of Allowances
CTDR	Commercial Training Device Requirement
CTEA	Cost and Training Effectiveness Analysis

ACRONYMS AND ABBREVIATIONS

C³I Command, Control, Communications and Intelligence

-D-

DA Department of the Army
 DAC Days after Contract Award
 DALSO Department of the Army Logistics Staff Officer
 DAMPL DA Master Priority List
 DAP Designated Acquisition Program
 DASC DA System Coordinator
 DCP Decision Coordinating Paper
 DCSLOG Deputy Chief of Staff for Logistics
 DCSOPS Deputy Chief of Staff for Operations and Plans
 DCSPER Deputy Chief of Staff for Personnel
 DID Data Item Description
 DMDC Defense Management Data Center
 DoD Department of Defense
 DoDISS Department of Defense Index of Specifications and
 Standards
 DoDSTD Department of Defense Standard
 DT Developmental Test(ing) - SEE "TT"
 DTTP Doctrine and Tactics Training Plan
 DUNS Data Universal Numbering System

-E-

E Environment
 ECA Early Comparability Analysis
 ECP Engineering Change Proposal
 EMF Enlisted Master File
 EPMS Enlisted Personnel Management System
 EOC End of Contract
 ET Embedded Training
 EUTE Early User Test and Experimentation

-F-

FAT First Article Test
 FEA Front End Analysis
 FISO Force Integration Staff Officer
 FM Field Manual
 FOTE Follow-on Test and Evaluation
 FUE First Unit Equipped
 FYDP Five Year Development Plan

-G-

GFE Government Furnished Equipment

-H-

ACRONYMS AND ABBREVIATIONS

HARDMAN	Hardware versus Manpower
HCM	HARDMAN Comparability Methodology
HEL	Human Engineering Laboratories
HEP	Human Engineering Program
HFE	Human Factors Engineering
HFEA	Human Factors Engineering Analysis (MANPRINT Assessment)
HHA	Health Hazard Assessment
HHAR	Health Hazard Assessment Report
HQDA	Headquarters, Department of the Army

-I-

IAP	Independent Assessment Plan
IAR	Independent Assessment Report
IAW	In Accordance With
ICE	Independent Cost Estimate
ICTP	Individual and Collective Training Plan - SEE "STRAP"
IEP	Independent Evaluation Plan
IER	Independent Evaluation Report
IET	Initial Entry Training
ILS	Integrated Logistics Support
IOC	Initial Operational Capability
IPR	In-process Review
IR&D	Independent Research and Development
ISP	Integrated Support Plan
ITEP	Individual Training Evaluation Plan
ITS	Integrated Training System
ITSP	Integrated Training System Plan

-J-

JMSNS	Justification for Major System New Start - SEE "MNS"
JRMB	Joint Requirements and Management Board
JTA	Joint Table of Allowances
JWG	Joint Working Group

-L-

LCSMM	Life Cycle System Management Model
LOGSACS	Logistics Structure and Composition System
LRRDAP	Long Range Research, Development, and Acquisition Plan
LSA	Logistics Support Analysis
LSAR	Logistics Support Analysis Record

-M-

MAA	Mission Area Analysis
MACOM	Major Command
MADP	Materiel Acquisition Decision Process

ACRONYMS AND ABBREVIATIONS

MAMP	Mission Area Management Plan
MANPRINT	Manpower and Personnel Integration
MARC	Manpower Requirements Criteria
MATDEV	Materiel Developer
MDEP	Management Decision Package
MEPSCAT	Military Entrance Physical Strength Capacity Test
MI	Market Investigation
MIL-HDBK	Military Handbook
MIL-STD	Military Standard
MJWG	MANPRINT Joint Working Group
MNS	Major New System
MOPP	Mission Oriented Protective Posture
MOS	Military Occupational Specialty
MPT	Manpower, Personnel, and Training
MRSA	U.S. Army Materiel Readiness Support Activity
MSC	Major Subordinate Command
MSE	Multiple Subscriber Equipment
MTBF	Mean Time Between Failure
MTOE	Modified Table of Organization and Equipment
MTTR	Mean Time To Repair

-N-

NBC	Nuclear, Biological, and Chemical
NDI	Nondevelopmental Item
NET	New Equipment Training
NETP	New Equipment Training Plan
NETT	New Equipment Training Team
NLT	Not Later Than
NTC	National Training Center
NTE	Not To Exceed

-O-

O&O	Operational and Organizational Plan
OMF	Officer Master File
OSE	Other Support Equipment
OT	Operational Test(ing) - SEE "UT"
OTEA	U.S. Army Operational Test Evaluation Activity
OTP	Outline Test Plan
OTSG	Office of the Surgeon General

-P-

P ³ I	Preplanned Product Improvement
P _e	Equipment Performance
P _h	Human Performance
P _s	System Performance
PAM	Pamphlet
PDR	Preliminary Design Review

ACRONYMS AND ABBREVIATIONS

PEO	Procurement Executive Office
PDM	Program Decision Memorandum
PERSACS	Personnel Structure and Composition System
PERSSO	Personnel System Staff Officer
PI	Program Initiation
PIP	Product Improvement Program
PPI	Preprogram Initiation
PM	Program or Project Manager
PMAD	Personnel Management Authorization Document
PMD	Program Management Document
PMO	Preventive Medicine Officer
PMSC	Preventive Maintenance Service Check
POI	Program of Instruction
PSE	Peculiar Support Equipment

-Q-

QE	Quality Engineering
QOPRI	Qualitative and Quantitative Personnel Requirements Information

-R-

RAM	Reliability, Availability, and Maintainability
RDA	Research, Development, and Acquisition
RDTE	Research, Development, Test, and Evaluation
RFP	Request for Proposal
RFQ	Request for Quotation
ROC	Required Operational Capability

-S-

SAR	Safety Assessment Report
SAT	System Approach to Training
SC	Specialty Code
SCP	System Concept Paper
SDC	Sample Data Collection
SECDEF	Secretary of Defense
SMMP	System MANPRINT Management Plan
SOW	Statement of Work
SQI	Special Skill Identifier
SQT	Soldier Qualification Test
SS	System Safety
SSC-NCR	Soldier Support Center - National Capital Region
SSEB	Source Selection Evaluation Board
SSWG	System Safety Working Group
STRAP	System Training Plan - formerly "ICTP"
STP	Soldier Training Package

-T-

ACRONYMS AND ABBREVIATIONS

TAD	Target Audience Description
TAPA	Total Army Personnel Agency - Formerly MILPERCEN
TC	Type Classification
T&E	Test and Evaluation
TDA	Table of Distribution and Allowances
TDNS	Training Device Need Statement
TDP	Test Design Plan (can also be Technical Data Package)
TDR	Training Device Requirement
TDS	Training Device Studies
TEA	Training Effectiveness Analysis
TECOM	U.S. Army Test and Evaluation Command
TEMP	Test and Evaluation Master Plan
TIWG	Test Integration Working Group
TMDE	Test, Measurement, and Diagnostic Equipment
TOA	Trade-Off Analysis
TOD	Trade-Off Determination
TOE	Table of Organization and Equipment
TR	Technical Report
TRADOC	U.S. Army Training and Doctrine Command
TRASSO	TRADOC System Staff Officer
TSG	The Surgeon General
TSM	TRADOC System Manager
TT	Technical Testing - formerly "DT"

-U-

UIC	Unit Identification Code
USAR	U.S. Army Reserve
USASC	U.S. Army Safety Center
UT	User Testing - formerly "OT"

-W-

WBS	Work Breakdown Structure
WSSM	Weapon System Staff Manager
WSSO	Weapon System Support Officer

APPENDIX D

REFERENCES AND SELECTED READING LIST

**APPENDIX D
REFERENCES AND SELECTED READING LIST**

DEPARTMENT OF DEFENSE DIRECTIVES (DODD)

- 4105.62 Selection of Contractual Sources for Major Defense Systems
- 5000.1 Major and Nonmajor Defense Acquisition Program
- 5000.3 Test and Evaluation
- 5000.39 Acquisition and Management of Integrated Logistics Support for Systems and Equipment
- 5000.40 Reliability and Maintainability
- 5000.43 Acquisition Streamlining

DEPARTMENT OF DEFENSE INSTRUCTIONS (DODI)

- 5000.2 Defense Acquisition Program Procedures
- 5000.36 System Safety Engineering and Management

ARMY REGULATIONS (AR)

- 15-14 System Acquisition Review Council Procedures
- 40-5 Health and Environment
- 40-10 Health Hazard Assessment Program in Support of the Army Materiel Acquisition Decision Process
- 40-14 Control and Recording Procedures for Exposure to Ionizing Radiation and Radioactive Materials
- 40-46 Control of Health Hazards from Lasers and Other High Intensity Optical Sources
- 40-501 Standards of Medical Fitness
- 40-583 Control of Potential Hazards to Health from Microwave and Radio Frequency Radiation
- 70-1 System Acquisition Policy and Procedure
- 70-8 Personnel Performance and Training Program (PPTP)

Please refer to page D-8 for information on how to obtain publications listed.

REFERENCES AND SELECTED READING

(ARMY REGULATIONS Continued)

- 70-10 Test and Evaluation
- 71-2 Basis of Issue Plan (BOIP) and Qualitative and
Quantitative Personnel Requirements Information (QQPRI)
- 71-3 User Testing
- 71-9 Materiel Objectives and Requirements
- 310-3 Preparation, Coordination, and Approval of Department of
the Army Publications
- 310-49 The Army Authorization Document System
- 350-35 Army Modernization Training
- 350-38 Training Device Policies and Procedures
- 385-10 The Army Safety Program
- 385-16 System Safety Engineering and Management
- 570-1 Commissioned Officer Position Criteria
- 570-2 Manpower Requirements Criteria (MARC) of
Organization and Equipment
- 570-4 Manpower Management
- 570-5 Manpower Staffing, Standards System
- 602-1 Human Factors Engineering Program
- 602-2 Manpower and Personnel Integration (MANPRINT) in Materiel
Acquisition Process
- 611-101 Commissioned Officer Specialty Classification System
- 611-112 Manual of Warrant Officer Military Occupational
Specialties
- 611-201 Enlisted Career Management Fields and Military
Occupational Specialties
- 700-127 Integrated Logistic Support

*Please refer to page D-8 for information on how to obtain
publications listed.*

REFERENCES AND SELECTED READING

CHIEF OF STAFF REGULATIONS (CSR)

- 71-3 Operational Testing and Evaluation Methodology and Procedures Guide
- 11-2 Research and Development Cost Guide
- 11-3 Investment Costs Guide for Army Materiel Systems
- 11-4 Operation and Support Cost Guide for Army Materiel Systems
- 11-5 Standards for Presentation and Documentation of Life Cycle Cost Estimates
- 11-15 The Army Long-Range Planning System

DEPARTMENT OF THE ARMY PAMPHLETS (PAM)

- 11-25 Life Cycle System Management Model for Army Systems
- 70-21 A Test and Evaluation Guide
- 385-16 System Safety Management Guide

DEPARTMENT OF THE ARMY CIRCULARS (CIR)

- 600-82-2 The New Manning System

AMC REGULATIONS (AMC-R)

- 700-15 Integrated Logistic Support

AMC PAMPHLETS (AMC-P)

- 602-1 MANPRINT Handbook for RFP Development
- 715-3 The Source Selection Process

AMC CIRCULAR (AMC-C)

- 602-1 Manpower and Personnel Integration (MANPRINT)

TRADOC REGULATIONS (TRADOC-R)

- 350-7 A Systems Approach to Training

Please refer to page D-8 for information on how to obtain publications listed.

REFERENCES AND SELECTED READING

- 351-1 Training Requirements Analysis System
- 351-5 Designation of Military Occupational Specialties
 (MOS) and Additional Skill Identifier (ASI) Proponency
- 700-1 Integrated Logistic Support

TRADOC PAMPHLETS

- 11-8 Studies and Analysis Handbook
- 71-8 Analyzing Training Effectiveness

AMC-TRADOC

- 70-1 System Acquisition Policy and Procedures
- PAM 70-2 Materiel Acquisition Handbook
- MOU, dtd 15 MAR 84. Integrated Logistic Support

FIELD MANUALS (FM)

- 22-9 Soldier Performance in Continuous Operations
- 101-10-1 Staff Officer's Field Manual, Organizational, Technical
 and Logistical Data

MILITARY STANDARDS (MIL-STD)

- 490 Specification Practices
- 882 System Safety Program Requirements
- 1379-3 Contract Training Programs
- 1388-1A Logistics Support Analysis
- 1388-2A Logistics Support Analysis Record
- 1472 Human Engineering Design Criteria for Military Systems,
 Equipment and Facilities
- 1474 Noise Limits for Army Materiel

*Please refer to page D-8 for information on how to obtain
publications listed.*

REFERENCES AND SELECTED READING

MILITARY SPECIFICATIONS

T-23991 Training Devices, Military, General Specification for
H-46855 Human Engineering Requirements for Military Systems,
 Equipment and Facilities

MILITARY HANDBOOKS

MIL-HDBK 245 Preparation of Statement of Work (SOW)
DOD-HDBK 743 Anthropometry of U.S. Military Personnel
MIL-HDBK 759 Human Factors Engineering Design for Army Materiel
DOD-HDBK 763 Human Engineering Procedures Guide

OTHER RELATED

Aeronautical Human Engineering Requirements for Measurement
Design Std of Operator Workload
ADS-30

MANPRINT-RELATED AUTHORIZED DATA ITEM DESCRIPTIONS

A. MANPOWER

<u>Number</u>	<u>Title</u>
DIS-HFAC-80243	Personnel Planning Report
DI-ILSS-80077	Manpower, Personnel and Training Analysis Report
DI-ILSS-80114	Logistic Support Analysis Record (LSAR) Data

B. PERSONNEL

<u>Number</u>	<u>Title</u>
DI-H-1300	Personnel and Training Requirements
DI-H-7059	Human Engineering Test Report
DI-H-7068	Task and Skill Analysis Report
DI-H-25713B	Task Listings Report
DI-H-33059	Qualitative and Quantitative Personnel Information
DI-HFAC-80243	Personnel Planning Report
DI-ILSS-80078	Personnel Performance Profiles
DI-ILSS-80115	LSA-015, Sequential Task Description Report

*Please refer to page D-8 for information on how to obtain
publications listed.*

REFERENCES AND SELECTED READING**C. Training**

<u>Number</u>	<u>Title</u>
DI-H-1300	Personnel and Training Requirements
DI-H-7066	Training and Training Equipment Plan
DI-H-7067	Training Course Proposal
DI-H-7069	Training Course and Curriculum Outlines
DI-H-7072	Audio Aids, Master Reproducibles and Review Copies for Training Equipment and Training Courses
DI-H-7076	Instructor's Utilization Handbook for Simulation Equipment
DI-H-25711B	Training Development and Support Plan Report
DI-H-25713B	Task Listing Report
DI-H-25718B	Trainer Functional Description Report
DI-H-25721B	Training Support Requirements Report
DI-H-25724B	Student Training Materials
DI-H-25728B	Instructor Training Course Materials
DI-H-25774B	Training Program Work Report
DI-ILSS-80047	Training Court Standards
DI-ILSS-80076	Training Program and Training Equipment Plan
DI-ILSS-80077	Manpower, Personnel and Training Analysis Report
DI-ILSS-80084	Training Material Outline
DI-ILSS-80143	Training Plan

D. HUMAN FACTORS ENGINEERING

<u>Number</u>	<u>Title</u>
DI-H-7051	Human Engineering Program Plan
DI-H-7052	Human Engineering Dynamic Simulation Plan
DI-H-7053	Human Engineering Test Plan
DI-H-7054	Human Engineering System Analysis Report
DI-H-7055	Critical Task Analysis Report
DI-H-7056	Human Engineering Design Approach Document--Operator
DI-H-7057	Human Engineering Design Approach Document--Maintainer
DI-H-7058	Human Engineering Test Report
DI-H-7059	Human Engineering Progress Report
DI-HFAC-80241	Human Factors Technical Report
DI-HFAC-80242	Human Factors Design Analysis Report
UDI-H-20002A	Report, Design Review

E. SYSTEM SAFETY

DI-H-1321B	Explosive Hazard Classification Data
DI-H-1329A	Accident or Incident Report

*Please refer to page D-8 for information on how to obtain
publications listed.*

REFERENCES AND SELECTED READING

<u>Number</u>	<u>Title</u>
DI-H-1336	Noise Measurement Report
DI-H-1838	Standard Operating Procedures for Hazardous Materials
DI-SAFT-80100	System Safety Program Plan
DI-SAFT-80101	System Safety Hazard Analysis Report
DI-SAFT-80102	Safety Assessment Report
DI-SAFT-80103	Engineering Change Proposal System Safety Report
DI-SAFT080104	Waiver or Deviation System Safety Report
DI-SAFT-80105	System Safety Program Progress Report

F. HEALTH HAZARDS

<u>Number</u>	<u>Title</u>
DI-SAFT-80106	Occupational Health Hazard Assessment
DI-MISC-80123	Medical and Health Plan

OTHER PUBLICATIONS:

ALTMAN, James W., Human Engineering Guide to Equipment Design. Washington, D.C.: U.S. Govt. Printing Office, 1963.

CHAIKIN, G. and McCOMMONS, R., Human Factors Engineering Material for Manpower and Personnel Integration (MANPRINT) Provisions of the Request for Proposal (RFP). Aberdeen Proving Ground, MD: U.S. Army Human Engineering Laboratory Technical Memorandum 13-86, October 1986.

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Please refer to page D-8 for information on how to publications listed.

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MANPRINT Primer. Washington, D.C.: Draft manuscript prepared by HAY Systems Inc, for Office of the Deputy Chief of Staff for Personnel, HQDA, April 1987.

MANPRINT Risk Assessment. Alexandria, VA: Analysis Integration Branch, Soldier Support Center-National Capital Region, September 1987.

MANPRINT in the Source Selection Process. Washington, D.C.: Draft manuscript prepared by Automated Research Systems, LTD, for Office of the Deputy Chief of Staff for Personnel, HQDA, December 1986.

MEISTER, David., Behavioral Analysis and Measurement Methods. New York, New York: John Wiley & Sons, Inc., 1985.

MYERS, Louis B., TIJERINA, Louis, and GEDDIE, James C., Proposed Military Standard for Task Analysis. Aberdeen Proving Ground, MD: U.S. Army Human Engineering Laboratory Technical Memorandum 13-87, July 1987.

System MANPRINT Management Plan Procedural Guide. Alexandria, VA: Soldier Support Center - National Capital Region (ATNC-NMF-B), February 1987.

Training Developers' Procedural Guide - Training Device Documentation. Fort Eustis, VA: U.S. Army Training Support Center, Devices Management Directorate, January 1987.

Training Developers' Procedural Guide - Training Device Documentation Checklist. Fort Eustis, VA: U.S. Army Training Support Center, Devices Management Directorate, July 1987.

Training Developers' Procedural Guide - Conduct of Training Effectiveness Analyses in Support of Non-system Training Devices. Fort Eustis, VA: U.S. Army Training Support Center, Devices Management Directorate, October 1987.

WOODSON, Wesley E., Human Factors Design Handbook. New York, New York: McGraw Hill Book Co., 1984.

••ORDERING INFORMATION••

DoD and Army Publications

Department of Defense Directives (DODD), Department of Defense Instructions (DODI), Army Regulations (AR), Chief of Staff

REFERENCES AND SELECTED READING

Regulations (CSR), Department of the Army Pamphlets (DA PAM), and Department of the Army Circulars (DA CIR) should be requested through official publication channels (for Army employees). All others may request Army publications from Commander, Army AG Publications Center 2800 Eastern Boulevard, Baltimore, MD 21220 and DoD publications from Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.

Military Specifications (MIL-SPEC), Standards (MIL-STD), Handbooks (MIL-HBK), and Data Item Descriptions (DIDs) should be requested on DD Form 1425 from Commander, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

Army Materiel Command (AMC)

AMC Regulations (AMC-R), Pamphlets (AMC-P), and Circulars (AMC-C) should be requested from Headquarters, U.S. Army Materiel Command, ATTN: AMXDO-SP, 5001 Eisenhower Avenue, Alexandria, VA 22333-0001.

Training and Doctrine Command (TRADOC)

TRADOC Regulations (TR-R), Pamphlets (TR-P), and Circulars (TR-C) should be requested from Headquarters, U.S. Army Training and Doctrine Command, ATTN: ATCD-SP, Fort Monroe, VA 23651-5000.

U.S. Army Human Engineering Laboratory (HEL)

HEL Technical Memorandums and Reports may be requested from Director, U.S. Army Human Engineering Laboratory, ATTN: Technical Reports Office, Aberdeen Proving Ground, MD 21005-5001.

U.S. Army Research Institute (ARI)

ARI Research Reports and Products may be requested from Commander, U.S. Army Research Institute, ATTN: PERI-SM, 50001 Eisenhower Avenue, Alexandria, VA 22333-5600.

Soldier Support Center - National Capitol Region (SSC-NCR)

SSC-NCR publication can be requested from Commander, U.S. Army Soldier Support Center - National Capitol Region, ATTN: ATNC-NMF-B, 200 Stovall Street, Alexandria, VA 22332.

HQDA, Deputy Chief of Staff for Personnel (DCSPER)

The MANPRINT Primer and MANPRINT in the Source Selection Process can be requested from Director, MANPRINT Policy Office, HQDA (DAPE-ZAM), Pentagon, Washington, D.C. 20310-0300.

Defense Technical Information Center (DTIC)

A general source (for government personnel and current contractors

AMC-P 602-2

REFERENCES AND SELECTED READING

only) of R&D reports which have completed the editorial and clearance processes is Defense Technical Information Center, Building 5, Cameron Station, Alexandria, VA 22304-6145.

If in doubt about how to obtain a document, consult How to Get It - A Guide to Defense-Related Information Resources published by the Institute for Defense Analysis and available from DTIC under AD Number A110000.